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Science & Technology

USSR: Science & Technology Policy

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Candidate Academicians, Corresponding Members of Academy of Sciences

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[Article under the rubric "Appendix": "From the Academy of Sciences of the Union of Soviet Socialist Republics"; first paragraph is *Vestnik Akademii Nauk SSSR* introduction]

[Text] The USSR Academy of Sciences, in conformity with Article 23 of the Charter, reports the names of the candidate full members (academicians) and corresponding members of the USSR Academy of Sciences, who were nominated on the basis of the notice in the newspaper *Izvestiya* of 14 (15) September 1987 by full members and corresponding members of the academies of sciences, the councils of scientific institutions and higher educational institutions, and state and public organizations.

Candidate Full Members (Academicians) of the USSR Academy of Sciences

The Mathematics Department

Arnold, Vladimir Igoryevich—corresponding member of the USSR Academy of Sciences.

Bakhvalov, Nikolay Sergeyevich—corresponding member of the USSR Academy of Sciences.

Vitushkin, Anatoliy Georgiyevich—corresponding member of the USSR Academy of Sciences.

Gamkrelidze, Revaz Valerianovich—corresponding member of the USSR Academy of Sciences.

Gonchar, Andrey Aleksandrovich—corresponding member of the USSR Academy of Sciences.

Karatsuba, Anatoliy Alekseyevich—doctor of physical mathematical sciences, professor.

Ladyzhenskaya, Olga Aleksandrovna—corresponding member of the USSR Academy of Sciences.

Lupanov, Oleg Borisovich—corresponding member of the USSR Academy of Sciences.

Marchenko, Vladimir Aleksandrovich—academician of the Ukrainian SSR Academy of Sciences.

Oleynik, Olga Arsenyevna—doctor of physical mathematical sciences, professor.

Platonov, Vladimir Petrovich—academician of the Belorussian SSR Academy of Sciences.

Rusanov, Viktor Vladimirovich—corresponding member of the USSR Academy of Sciences.

Shafarevich, Igor Rostislavovich—corresponding member of the USSR Academy of Sciences.

Yablonskiy, Sergey Vsevolodovich—corresponding member of the USSR Academy of Sciences.

The General Physics and Astronomy Department

Abrikosov, Aleksey Alekseyevich—corresponding member of the USSR Academy of Sciences.

Alekseyevskiy, Nikolay Yevgenyevich—corresponding member of the USSR Academy of Sciences.

Andreyev, Aleksandr Fedorovich—corresponding member of the USSR Academy of Sciences.

Boyarchuk, Aleksandr Alekseyevich—corresponding member of the USSR Academy of Sciences.

Bunkin, Fedor Vasilyevich—corresponding member of the USSR Academy of Sciences.

Galanin, Mikhail Dmitriyevich—corresponding member of the USSR Academy of Sciences.

Golant, Viktor Yevgenyevich—corresponding member of the USSR Academy of Sciences.

Gorkov, Lev Petrovich—corresponding member of the USSR Academy of Sciences.

Denisyuk, Yuriy Nikolayevich—corresponding member of the USSR Academy of Sciences.

Dzyaloshinskiy, Igor Yekhiyelyevich—corresponding member of the USSR Academy of Sciences.

Zakharchenya, Boris Petrovich—corresponding member of the USSR Academy of Sciences.

Kardashev, Nikolay Semenovich—corresponding member of the USSR Academy of Sciences.

Karlov, Nikolay Vasilyevich—corresponding member of the USSR Academy of Sciences.

Larkin, Anatoliy Ivanovich—corresponding member of the USSR Academy of Sciences.

Mandelshtam, Sergey Leonidovich—corresponding member of the USSR Academy of Sciences.

Migulin, Vladimir Vasilyevich—corresponding member of the USSR Academy of Sciences.

Osiko, Vyacheslav Vasilyevich—corresponding member of the USSR Academy of Sciences.

Perel, Vladimir Idelevich—corresponding member of the USSR Academy of Sciences.

Pitayevskiy, Lev Petrovich—corresponding member of the USSR Academy of Sciences.

Rebane, Karl Karlovich—corresponding member of the USSR Academy of Sciences.

Rusinov, Mikhail Mikhaylovich—doctor of technical sciences, professor.

Syunyayev, Rashid Aliyevich—corresponding member of the USSR Academy of Sciences.

Ter-Mikayelyan, Mikhail Leonovich—academician of the Armenian SSR Academy of Sciences.

Troitskiy, Vsevolod Sergeyevich—corresponding member of the USSR Academy of Sciences.

Sharvin, Yuriy Vasilyevich—corresponding member of the USSR Academy of Sciences.

The Nuclear Physics Department

Gribov, Vladimir Naumovich—corresponding member of the USSR Academy of Sciences.

Dzhelepov, Venedikt Petrovich—corresponding member of the USSR Academy of Sciences.

Lebashev, Vladimir Mikhaylovich—corresponding member of the USSR Academy of Sciences.

Nikolskiy, Sergey Ivanovich—corresponding member of the USSR Academy of Sciences.

Okun, Lev Borisovich—corresponding member of the USSR Academy of Sciences.

Pavlovskiy, Aleksandr Ivanovich—corresponding member of the USSR Academy of Sciences.

Polyakov, Aleksandr Markovich—corresponding member of the USSR Academy of Sciences.

Prokoshkin, Yuriy Dmitriyevich—corresponding member of the USSR Academy of Sciences.

Sidorov, Veniamin Aleksandrovich—corresponding member of the USSR Academy of Sciences.

Tavkhelidze, Albert Nikiforovich—corresponding member of the USSR Academy of Sciences.

Trutnev, Yuriy Alekseyevich—corresponding member of the USSR Academy of Sciences.

Feynberg, Yevgeniy Lvovich—corresponding member of the USSR Academy of Sciences.

Fradkin, Yefim Samoylovich—corresponding member of the USSR Academy of Sciences.

Chudakov, Aleksandr Yevgenyevich—corresponding member of the USSR Academy of Sciences.

Shapiro, Iosif Solomonovich—corresponding member of the USSR Academy of Sciences.

Shirkov, Dmitriy Vasilyevich—corresponding member of the USSR Academy of Sciences.

The Physical Technical Problems of Power Engineering Department

Alemasov, Vycheslav Yevgenyevich—corresponding member of the USSR Academy of Sciences.

Biberman, Leon Mikhaylovich—corresponding member of the USSR Academy of Sciences.

Vengerskiy, Vadim Vladimirovich—corresponding member of the USSR Academy of Sciences.

Glukhikh, Vasiliy Andreyevich—corresponding member of the USSR Academy of Sciences.

Iyevlev, Vitaliy Mikhaylovich—corresponding member of the USSR Academy of Sciences.

Kiryukhin, Vladimir Ivanovich—corresponding member of the USSR Academy of Sciences.

Konopatov, Aleksandr Dmitriyevich—corresponding member of the USSR Academy of Sciences.

Kulakov, Anatoliy Vasilyevich—corresponding member of the USSR Academy of Sciences.

Novikov, Ivan Ivanovich—corresponding member of the USSR Academy of Sciences.

Ponomarev-Stepnoy, Nikolay Nikolayevich—corresponding member of the USSR Academy of Sciences.

Pukhov, Georgiy Yevgenyevich—Academician of the Ukrainian SSR Academy of Sciences.

Sarkisov, Ashot Arakelovich—corresponding member of the USSR Academy of Sciences.

Subbotin, Valeriy Ivanovich—corresponding member of the USSR Academy of Sciences.

Talroze, Viktor Lvovich—corresponding member of the USSR Academy of Sciences.

Tikhodeyev, Nikolay Nikolayevich—corresponding member of the USSR Academy of Sciences.

Favorskiy, Oleg Nikolayevich—corresponding member of the USSR Academy of Sciences.

Khabibullayev, Pulat Kirgizbayevich—corresponding member of the USSR Academy of Sciences.

Khlopkin, Nikolay Sidorovich—corresponding member of the USSR Academy of Sciences.

Shpilrayn, Evald Emilyevich—doctor of technical sciences, professor.

The Problems of Machine Building, Mechanics, and Control Processes Department

Anfimov, Nikolay Apollonovich—corresponding member of the USSR Academy of Sciences.

Belyanin, Petr Nikolayevich—corresponding member of the USSR Academy of Sciences.

Bolotin, Vladimir Vasilyevich—corresponding member of the USSR Academy of Sciences.

Vorovich, Iosif Izrailevich—corresponding member of the USSR Academy of Sciences.

Grigolyuk, Eduard Ivanovich—corresponding member of the USSR Academy of Sciences.

Guz, Aleksandr Nikolayevich—academician of the Ukrainian SSR Academy of Sciences.

Zubov, Vladimir Ivanovich—corresponding member of the USSR Academy of Sciences.

Kirko, Igor Mikhaylovich—academician of the Latvian SSR Academy of Sciences.

Klimov, Dmitriy Mikhaylovich—corresponding member of the USSR Academy of Sciences.

Kovtunenko, Vyacheslav Mikhaylovich—corresponding member of the USSR Academy of Sciences.

Kolesnikov, Konstantin Sergeyevich—corresponding member of the USSR Academy of Sciences.

Krasovskiy, Aleksandr Arkadyevich—corresponding member of the USSR Academy of Sciences.

Logvinovich, Georgiy Vladimirovich—academician of the Ukrainian SSR Academy of Sciences.

Lozino-Lozinskiy, Gleb Yevgenyevich—doctor of technical sciences.

Matrosov, Vladimir Mefodyevich—corresponding member of the USSR Academy of Sciences.

Mitenkov, Fedor Mikhaylovich—corresponding member of the USSR Academy of Sciences.

Nepobedimyy, Sergey Pavlovich—corresponding member of the USSR Academy of Sciences.

Okhotsimskiy, Dmitriy Yevgenyevich—corresponding member of the USSR Academy of Sciences.

Poturayev, Valentin Nikitich—academician of the Ukrainian SSR Academy of Sciences.

Prangishvili, Iveri Varlamovich—academician of the Georgian SSR Academy of Sciences.

Rvachev, Vladimir Logvinovich—academician of the Ukrainian SSR Academy of Sciences.

Rumyantsev, Valentin Vitalyevich—corresponding member of the USSR Academy of Sciences.

Ryzhov, Yuriy Alekseyevich—corresponding member of the USSR Academy of Sciences.

Semikhatov, Nikolay Aleksandrovich—corresponding member of the USSR Academy of Sciences.

Spasskiy, Igor Dmitriyevich—corresponding member of the USSR Academy of Sciences.

Sychev, Vladimir Vasilyevich—corresponding member of the USSR Academy of Sciences.

Chertok, Boris Yevseyevich—corresponding member of the USSR Academy of Sciences.

The Information Science, Computer Technology, and Automation Department

Basistov, Anatoliy Georgiyevich—corresponding member of the USSR Academy of Sciences.

Bakhrakh, Lev Davidovich—corresponding member of the USSR Academy of Sciences.

Bitsadze, Andrey Vasilyevich—corresponding member of the USSR Academy of Sciences.

Govorun, Nikolay Nikolayevich—corresponding member of the USSR Academy of Sciences.

Guskov, Gennadiy Yakovlevich—corresponding member of the USSR Academy of Sciences.

Yevtikhiyev, Nikolay Nikolayevich—corresponding member of the USSR Academy of Sciences.

Kalyayev, Anatoliy Vasilyevich—corresponding member of the USSR Academy of Sciences.

Kozlov, Dmitriy Ilich—corresponding member of the USSR Academy of Sciences.

Makarov, Igor Mikhaylovich—corresponding member of the USSR Academy of Sciences.

Miroshnikov, Mikhail Mikhaylovich—corresponding member of the USSR Academy of Sciences.

Petrov, Vyacheslav Vyacheslavovich—corresponding member of the USSR Academy of Sciences.

Stafeyev, Vitaliy Ivanovich—doctor of physical mathematical sciences, professor.

Tsypkin, Yakov Zalmanovich—corresponding member of the USSR Academy of Sciences.

Chavchanidze, Vladimir Valerianovich—academician of the Georgian SSR Academy of Sciences.

Shipunov, Arkadiy Georgiyevich—corresponding member of the USSR Academy of Sciences.

The General and Technical Chemistry Department

Alfimov, Mikhail Vladimirovich—corresponding member of the USSR Academy of Sciences.

Beletskaya, Irina Petrovna—corresponding member of the USSR Academy of Sciences.

Blyumenfeld, Lev Aleksandrovich—doctor of chemical sciences, professor.

Volpin, Mark Yefimovich—corresponding member of the USSR Academy of Sciences.

Voronkov, Mikhail Grigoryevich—corresponding member of the USSR Academy of Sciences.

Gidaspov, Boris Veniaminovich—corresponding member of the USSR Academy of Sciences.

Gryaznov, Vladimir Mikhaylovich—corresponding member of the USSR Academy of Sciences.

Deryagin, Boris Vladimirovich—corresponding member of the USSR Academy of Sciences.

Zhdanov, Yuriy Andreyevich—corresponding member of the USSR Academy of Sciences.

Zefirov, Nikolay Serafimovich—corresponding member of the USSR Academy of Sciences.

Kabanov, Viktov Aleksandrovich—corresponding member of the USSR Academy of Sciences.

Kazanskiy, Vladimir Borisovich—corresponding member of the USSR Academy of Sciences.

Kuntsevich, Anatoliy Demyanovich—corresponding member of the USSR Academy of Sciences.

Nefedov, Oleg Matveyevich—corresponding member of the USSR Academy of Sciences.

Nikiforov, Aleksandr Sergeyevich—corresponding member of the USSR Academy of Sciences.

Ovchinnikov, Aleksandr Anatolyevich—corresponding member of the USSR Academy of Sciences.

Pentin, Yuriy Andreyevich—doctor of chemical sciences, professor.

Petrov, Anatoliy Aleksandrovich—corresponding member of the USSR Academy of Sciences.

Plate, Nikolay Alfredovich—corresponding member of the USSR Academy of Sciences.

Pudovik, Arkadiy Nikolayevich—corresponding member of the USSR Academy of Sciences.

Rafikov, Sagid Raufovich—corresponding member of the USSR Academy of Sciences.

Rusanov, Anatoliy Ivanovich—doctor of chemical sciences, professor.

Sakovich, Gennadiy Viktorovich—corresponding member of the USSR Academy of Sciences.

Shilov, Aleksandr Yevgenyevich—corresponding member of the USSR Academy of Sciences.

Shorygin, Petr Pavlovich—corresponding member of the USSR Academy of Sciences.

Shchukin, Yevgeniy Dmitriyevich—full member of the USSR Academy of Pedagogical Sciences.

The Physical Chemistry and Technology of Inorganic Materials Department

Zolotov, Yuriy Aleksandrovich—corresponding member of the USSR Academy of Sciences.

Krestov, Gennadiy Alekseyevich—corresponding member of the USSR Academy of Sciences.

Lvov, Boris Vladimirovich—doctor of physical mathematical sciences, professor.

Lyakishev, Nikolay Pavlovich—corresponding member of the USSR Academy of Sciences.

Mokhosyev, Marks Vasilyevich—corresponding member of the USSR Academy of Sciences.

Purin, Bruno Andreyevich—corresponding member of the USSR Academy of Sciences.

Reshetnikov, Fedor Grigoryevich—corresponding member of the USSR Academy of Sciences.

Tretyakov, Yuriy Dmitriyevich—corresponding member of the USSR Academy of Sciences.

Trefilov, Viktor Ivanovich—academician of the Ukrainian SSR Academy of Sciences.

Yakovlev, Sergey Vasilyevich—corresponding member of the USSR Academy of Sciences.

The Biochemistry, Biophysics, and Chemistry of Physiologically Active Compounds Department

Bergelson, Lev Davydovich—corresponding member of the USSR Academy of Sciences.

Butenko, Raisa Georgiyevna—corresponding member of the USSR Academy of Sciences.

Georgiyev, Georgiy Pavlovich—corresponding member of the USSR Academy of Sciences.

Zavarzin, Georgiy Aleksandrovich—corresponding member of the USSR Academy of Sciences.

Ivanov, Vadim Tikhonovich—corresponding member of the USSR Academy of Sciences.

Ivanov, Mikhail Vladimirovich—corresponding member of the USSR Academy of Sciences.

Kondratyeva, Yelena Nikolayevna—corresponding member of the USSR Academy of Sciences.

Mirzabekov, Andrey Daryevich—corresponding member of the USSR Academy of Sciences.

Mokronosov, Adolf Trofimovich—corresponding member of the USSR Academy of Sciences.

Nasyrov, Yusuf Saidovich—academician of the Tajik SSR Academy of Sciences.

Skulachev, Vladimir Petrovich—corresponding member of the USSR Academy of Sciences.

Smirnov, Vladimir Nikolayevich—corresponding member of the USSR Academy of Sciences.

Sytnik, Konstantin Merkuryevich—academician of the Ukrainian SSR Academy of Sciences.

Tarchevskiy, Igor Anatolyevich—corresponding member of the USSR Academy of Sciences.

Khomutov, Radiy Mikhaylovich—corresponding member of the USSR Academy of Sciences.

The Physiology Department

Okudzhava, Vazha Mikhaylovich—academician of the Georgian SSR Academy of Sciences.

Sviderskiy, Vladimir Leonidovich—corresponding member of the USSR Academy of Sciences.

Simonov, Pavel Vasilyevich—corresponding member of the USSR Academy of Sciences.

Skok, Vladimir Ivanovich—academician of the Ukrainian SSR Academy of Sciences.

Sultanov, Faut Fayzrakhmanovich—academician of the Turkmen SSR Academy of Sciences.

Tkachenko, Boris Ivanovich—academician of the USSR Academy of Medical Sciences.

Turpayev, Tigran Melkumovich—corresponding member of the USSR Academy of Sciences.

Khananashvili, Mikhail Mikhaylovich—academician of the USSR Academy of Medical Sciences.

Chaylakhyan, Levon Mikhaylovich—corresponding member of the USSR Academy of Sciences.

The General Biology Department

Zhuchenko, Aleksandr Aleksandrovich—corresponding member of the USSR Academy of Sciences.

Rapoport, Iosif Abramovich—corresponding member of the USSR Academy of Sciences.

Sozinov, Aleksey Alekseyevich—academician of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin and the Ukrainian SSR Academy of Sciences.

Strunnikov, Vladimir Aleksandrovich—corresponding member of the USSR Academy of Sciences.

Shumnyy, Vladimir Konstantinovich—corresponding member of the USSR Academy of Sciences.

The Geology, Geophysics, Geochemistry, and Mining Sciences Department

Barsukov, Valeriy Leonidovich—corresponding member of the USSR Academy of Sciences.

Budyko, Mikhail Ivanovich—corresponding member of the USSR Academy of Sciences.

Garetskiy, Radim Gavrilovich—academician of the Belorussian SSR Academy of Sciences.

Gramberg, Igor Sergeyevich—corresponding member of the USSR Academy of Sciences.

Gubin, Igor Yevgenyevich—corresponding member of the USSR Academy of Sciences.

Dymkin, Aleksandr Mikhaylovich—corresponding member of the USSR Academy of Sciences.

Zharikov, Vilen Andreyevich—corresponding member of the USSR Academy of Sciences.

Karus, Yevgeniy Villiamovich—corresponding member of the USSR Academy of Sciences.

Keylis-Borok, Vladimir Isaakovich—doctor of physical mathematical sciences, professor.

Laverov, Nikolay Pavlovich—corresponding member of the USSR Academy of Sciences.

Lisitsyn, Aleksandr Petrovich—corresponding member of the USSR Academy of Sciences.

Milanovskiy, Yevgeniy Yegenyvich—corresponding member of the USSR Academy of Sciences.

Odekov, Odek Akchayevich—corresponding member of the Turkmen SSR Academy of Sciences.

Radkevich, Yekaterina Aleksandrovna—corresponding member of the USSR Academy of Sciences.

Revnivtsev, Vladimir Ivanovich—corresponding member of the USSR Academy of Sciences.

Ronov, Aleksandr Borisovich—corresponding member of the USSR Academy of Sciences.

Solovyev, Sergey Leonidovich—corresponding member of the USSR Academy of Sciences.

Timofeyev, Petr Petrovich—corresponding member of the USSR Academy of Sciences.

Khain, Viktor Yefimovich—corresponding member of the USSR Academy of Sciences.

Chekunov, Anatoliy Vasilyevich—academician of the Ukrainian SSR Academy of Sciences.

Shcheglov, Aleksey Dmitriyevich—corresponding member of the USSR Academy of Sciences.

Shcherbak, Nikolay Petrovich—academician of the Ukrainian SSR Academy of Sciences.

The Oceanology, Atmospheric Physics, and Geography Department

Golytsin, Georgiy Sergeyevich—corresponding member of the USSR Academy of Sciences.

Monin, Andrey Sergeyevich—corresponding member of the USSR Academy of Sciences.

Sarkisyan, Artem Sarkisovich—corresponding member of the USSR Academy of Sciences.

The History Department

Alekseyev, Valeriy Pavlovich—corresponding member of the USSR Academy of Sciences.

Barg, Mikhail Abramovich—doctor of historical sciences, professor.

Volobuyev, Pavel Vasilyevich—corresponding member of the USSR Academy of Sciences.

Galoyan, Galust Anushavanovich—academician of the Armenian SSR Academy of Sciences.

Gutnova, Yevgeniya Vladimirovna—doctor of historical sciences, professor.

Druzhinina, Yelena Ioasafovna—corresponding member of the USSR Academy of Sciences.

Iskenderov, Akhmed Akhmedovich—corresponding member of the USSR Academy of Sciences.

Kim, Georgiy Fedorovich—corresponding member of the USSR Academy of Sciences.

Kovalchenko, Ivan Dmitriyevich—corresponding member of the USSR Academy of Sciences.

Kukushkin, Yuriy Stepanovich—corresponding member of the USSR Academy of Sciences.

Kutakov, Leonid Nikolayevich—doctor of historical sciences, professor.

Pisarev, Yuriy Alekseyevich—corresponding member of the USSR Academy of Sciences.

Polyakov, Yuriy Aleksandrovich—corresponding member of the USSR Academy of Sciences.

Rutenburg, Viktor Ivanovich—corresponding member of the USSR Academy of Sciences.

Sevostyanov, Grigoriy Nikolayevich—doctor of historical sciences, professor.

Tulepbayev, Baydabek Akhmedovich—corresponding member of the USSR Academy of Sciences.

Chistov, Kirill Vasilyevich—corresponding member of the USSR Academy of Sciences.

Yanin, Valentin Lavrentyevich—corresponding member of the USSR Academy of Sciences.

The Philosophy and Law Department

Asimov, Mukhamed Sayfitdinovich—corresponding member of the USSR Academy of Sciences.

Zadorozhnyy, Georgiy Petrovich—doctor of juridical sciences, professor.

Kerimov, Dzhangir Abbasovich—corresponding member of the USSR Academy of Sciences.

Kolbasov, Oleg Stepanovich—doctor of juridical sciences, professor.

Laptev, Vladimir Viktorovich—corresponding member of the USSR Academy of Sciences.

Melyukhin, Serafim Timofeyevich—corresponding member of the USSR Academy of Sciences.

Msheveniyeradze, Vladimir Vlasovich—corresponding member of the USSR Academy of Sciences.

Piskotin, Mikhail Ivanovich—doctor of historical sciences, professor.

Rutkevich, Mikhail Nikolayevich—corresponding member of the USSR Academy of Sciences.

Smirnov, Georgiy Lukich—corresponding member of the USSR Academy of Sciences.

Spirkin, Aleksandr Georgiyevich—corresponding member of the USSR Academy of Sciences.

Stepanyan, Tsolak Aleksandrovich—corresponding member of the USSR Academy of Sciences.

Frolov, Ivan Timofeyevich—corresponding member of the USSR Academy of Sciences.

Shinkaruk, Vladimir Illarionovich—corresponding member of the USSR Academy of Sciences.

The Economics Department

Abalkin, Leonid Ivanovich—corresponding member of the USSR Academy of Sciences.

Bunich, Pavel Grigoryevich—corresponding member of the USSR Academy of Sciences.

Granberg, Aleksandr Grigoryevich—corresponding member of the USSR Academy of Sciences.

Makarov, Valeriy Leonidovich—corresponding member of the USSR Academy of Sciences.

Nesterov, Petr Mikhaylovich—doctor of economic sciences, professor.

Petrakov, Nikolay Yakovlevich—corresponding member of the USSR Academy of Sciences.

Sitaryan, Stepan Aramaisovich—corresponding member of the USSR Academy of Sciences.

Timofeyev, Timur Timofeyevich—corresponding member of the USSR Academy of Sciences.

Shatalin, Stanislav Sergeyevich—corresponding member of the USSR Academy of Sciences.

Shiryayev, Yuriy Semenovich—corresponding member of the USSR Academy of Sciences.

The Literature and Language Department

Anikst, Aleksandr Abramovich—doctor of art criticism.

Bogolyubov, Mikhail Nikolayevich—corresponding member of the USSR Academy of Sciences.

Vipper, Yuriy Borisovich—corresponding member of the USSR Academy of Sciences.

Desnitskaya, Agniya Vasilyevna—corresponding member of the USSR Academy of Sciences.

Desheriyev, Yunus Desheriyevich—doctor of philological sciences, professor.

Dzhaukyan, Gevork Beglarovich—academician of the Armenian SSR Academy of Sciences.

Dyakonov, Igor Mikhaylovich—doctor of historical sciences.

Zalygin, Sergey Pavlovich—candidate of technical sciences.

Ivanov, Vyacheslav Vsevolodovich—doctor of philological sciences, professor.

Karaulov, Yuriy Nikolayevich—corresponding member of the USSR Academy of Sciences.

Knorozov, Yuriy Valentinovich—doctor of historical sciences.

Lomidze, Georgiy Iosifovich—corresponding member of the USSR Academy of Sciences.

Losev, Aleksey Fedorovich—doctor of philological sciences, professor.

Melnichuk, Aleksandr Savvich—corresponding member of the USSR Academy of Sciences.

Nikolayev, Petr Alekseyevich—corresponding member of the USSR Academy of Sciences.

Novikov, Vasiliy Vasilyevich—corresponding member of the USSR Academy of Sciences.

Solntsev, Vadim Mikhaylovich—corresponding member of the USSR Academy of Sciences.

Tenishev, Edkhyam Rakhimovich—corresponding member of the USSR Academy of Sciences.

Tolstoy, Nikita Ilich—corresponding member of the USSR Academy of Sciences.

Trubachev, Oleg Nikolayevich—corresponding member of the USSR Academy of Sciences.

Fedorenko, Nikolay Trofimovich—corresponding member of the USSR Academy of Sciences.

Fridlender, Georgiy Mikhaylovich—doctor of philological sciences.

Chelyshev, Yevgeniy Petrovich—corresponding member of the USSR Academy of Sciences.

Shvedova, Natalya Yulyevna—corresponding member of the USSR Academy of Sciences.

Shmelev, Dmitriy Nikolayevich—corresponding member of the USSR Academy of Sciences.

Shcherbina, Vladimir Rodionovich—corresponding member of the USSR Academy of Sciences.

The Far Eastern Department

Dikov, Nikolay Nikolayevich—corresponding member of the USSR Academy of Sciences.

Yelyakov, Georgiy Borisovich—corresponding member of the USSR Academy of Sciences.

Zhirmunskiy, Aleksey Viktorovich—corresponding member of the USSR Academy of Sciences.

Zolotov, Yevgeniy Vasilyevich—corresponding member of the USSR Academy of Sciences.

Krushanov, Andrey Ivanovich—corresponding member of the USSR Academy of Sciences.

Fedotov, Sergey Aleksandrovich—corresponding member of the USSR Academy of Sciences.

The Siberian Department

Borovkov, Aleksandr Alekseyevich—corresponding member of the USSR Academy of Sciences.

Voytsekhovskiy, Bogdan Vyacheslavovich—corresponding member of the USSR Academy of Sciences.

Godunov, Sergey Konstantinovich—corresponding member of the USSR Academy of Sciences.

Derevyanko, Anatoliy Panteleyevich—corresponding member of the USSR Academy of Sciences.

Dobretsov, Nikolay Leontyevich—corresponding member of the USSR Academy of Sciences.

Dulov, Viktor Georgiyevich—corresponding member of the USSR Academy of Sciences.

Yershov, Yuriy Leonidovich—corresponding member of the USSR Academy of Sciences.

Zamarayev, Kirill Ilich—corresponding member of the USSR Academy of Sciences.

Kuznetsov, Fedor Andreyevich—corresponding member of the USSR Academy of Sciences.

Mikhaylov, Gennadiy Alekseyevich—corresponding member of the USSR Academy of Sciences.

Nakoryakov, Vladimir Yeliferyevich—corresponding member of the USSR Academy of Sciences.

Nesterov, Ivan Ivanovich—corresponding member of the USSR Academy of Sciences.

Ovsyannikov, Lev Vasilyevich—corresponding member of the USSR Academy of Sciences.

Panin, Viktor Yevgenyevich—corresponding member of the USSR Academy of Sciences.

Polyakov, Gleb Vladimirovich—corresponding member of the USSR Academy of Sciences.

Reshetnyak, Yuriy Grigoryevich—corresponding member of the USSR Academy of Sciences.

Rudenko, Yuriy Nikolayevich—corresponding member of the USSR Academy of Sciences.

Sobolev, Nikolay Vladimirovich—corresponding member of the USSR Academy of Sciences.

Surkov, Viktor Semenovich —corresponding member of the USSR Academy of Sciences.

Titov, Vladimir Mikhaylovich—corresponding member of the USSR Academy of Sciences.

The Ural Department

Baraboshkin, Aleksey Nikolayevich—corresponding member of the USSR Academy of Sciences.

Bolshakov, Vladimir Nikolayevich—corresponding member of the USSR Academy of Sciences.

Kurzhanskiy, Aleksandr Borisovich—corresponding member of the USSR Academy of Sciences.

Osipov, Yuriy Sergeyevich—corresponding member of the USSR Academy of Sciences.

Tolstikov, Genrikh Aleksandrovich—corresponding member of the USSR Academy of Sciences.

Shveykin, Gennadiy Petrovich—corresponding member of the USSR Academy of Sciences.

Candidate Corresponding Members of the USSR Academy of Sciences

The Mathematics Department

Abramov, Aleksandr Aleksandrovich—doctor of physical mathematical sciences, professor.

Adyan, Sergey Ivanovich—doctor of physical mathematical sciences, professor.

Andrianov, Anatoliy Nikolayevich—doctor of physical mathematical sciences, professor.

Anosov, Dmitriy Viktorovich—doctor of physical mathematical sciences, professor.

Belyayev, Yuriy Konstantinovich—doctor of physical mathematical sciences, professor.

Besov, Oleg Vladimirovich—doctor of physical mathematical sciences, professor.

Bogomolov, Anatoliy Mikhaylovich—doctor of technical sciences, professor.

Dukhshtaber, Viktor Matveyevich—doctor of physical mathematical sciences.

Vasilyev, Anatoliy Mikhaylovich—doctor of physical mathematical sciences, professor.

Voyevodin, Valentin Vasilyevich—doctor of physical mathematical sciences, professor.

Grebenikov, Yevgeniy Aleksandrovich—doctor of physical mathematical sciences, professor.

Grigorchuk, Rostislav Ivanovich—doctor of physical mathematical sciences.

Dzhurayev, Abdukhamid Dzhurayevich—academician of the Tajik SSR Academy of Sciences.

Yegorov, Yuriy Vladimirovich—doctor of physical mathematical sciences, professor.

Yengibaryan, Norayr Bagratovich—doctor of physical mathematical sciences, professor.

Yermakov, Sergey Mikhaylovich—doctor of physical mathematical sciences, professor.

Zakharov, Vladimir Konstantinovich—doctor of physical mathematical sciences, professor.

Zolotarev, Vladimir Mikhaylovich—doctor of physical mathematical sciences, professor.

Ibragimov, Ildar Abdullovich—doctor of physical mathematical sciences, professor.

Ibragimov, Nail Khayrullovich—doctor of physical mathematical sciences, professor.

Kashin, Boris Sergeyevich—doctor of physical mathematical sciences.

Kirillov, Aleksandr Aleksandrovich—doctor of physical mathematical sciences, professor.

Kostyuchenko, Anatoliy Gordeyevich—doctor of physical mathematical sciences, professor.

Kruglov, Viktor Makarovich—doctor of physical mathematical sciences, professor.

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Blekhman, Ilya Izrailevich—doctor of physical mathematical sciences, professor.

Bobylev, Aleksandr Vasilyevich—doctor of physical mathematical sciences.

Borodavkin, Petr Petrovich—doctor of technical sciences, professor.

Budayev, Mikhail Mikhaylovich—doctor of technical sciences, professor.

Burkov, Vladimir Nikolayevich—doctor of technical sciences, professor.

Buyanov, Vladimir Aleksandrovich—doctor of technical sciences, professor.

Bykov, Aleksandr Vasilyevich—doctor of technical sciences.

Vaganov, Gennadiy Ivanovich—doctor of technical sciences, professor.

Valeyev, Kim Galyamovich—doctor of physical mathematical sciences, professor.

Vatazhin, Aleksandr Bentsianovich—doctor of physical mathematical sciences, professor.

Vakhrameyev, Yuriy Sergeyevich—doctor of physical mathematical sciences.

Velichenko, Vladislav Viktorovich—doctor of physical mathematical sciences, professor.

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Vystavkin, Aleksandr Nikolayevich—doctor of technical sciences, professor.

Galakhov, Mikhail Alekseyevich—doctor of physical mathematical sciences, professor.

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Gorshkov, Anatoliy Gerasimovich—doctor of physical mathematical sciences, professor.

Gribanov, Vitaliy Fedorovich—doctor of technical sciences, professor.

Grigoryan, Samvel Samvelovich—doctor of physical mathematical sciences, professor.

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Gubanov, Boris Ivanovich—doctor of technical sciences.

Gurko, Oleg Viktorovich—doctor of technical sciences.

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Yerkhov, Mikhail Ivanovich—doctor of technical sciences, professor.

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Zyuzin, Vladimir Ivanovich—doctor of technical sciences, professor.

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Konyukhov, Vadim Konstantinovich—doctor of physical mathematical sciences, professor.

Koryagin, Nikolay Ivanovich—doctor of technical sciences.

Kostyukov, Viktor Dorofeyevich—doctor of technical sciences, professor.

Kravchuk, Aleksandr Stepanovich—doctor of physical mathematical sciences, professor.

Krayko, Aleksandr Nikolayevich—doctor of physical mathematical sciences, professor.

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Krotov, Vadim Fedorovich—doctor of technical sciences, professor.

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Chepkin, Viktor Mikhaylovich—doctor of technical sciences.

Chernousko, Feliks Leonidovich—doctor of physical mathematical sciences, professor.

Chernykh, Klimentiy Feodosyevich—doctor of physical mathematical sciences, professor.

Chernyavskiy, Grigoriy Markelovich—doctor of technical sciences, professor.

Chetvergov, Vitaliy Alekseyevich—doctor of technical sciences, professor.

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Chumachenko, Boris Alekseyevich—doctor of technical sciences, professor.

Cucherov, Adolf Ivanovich—doctor of technical sciences, professor.

Shamshev, Kirill Nikolayevich—doctor of technical sciences, professor.

Shakhgildyan, Vagan Vaganovich—doctor of technical sciences, professor.

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Shirko, Igor Vladimirovich—doctor of physical mathematical sciences, professor.

Shirokov, Nikolay Nikolayevich—doctor of technical sciences, professor.

Shkadov, Leonid Mikhaylovich—doctor of technical sciences, professor.

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Shorr, Boris Fedorovich—doctor of technical sciences, professor.

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Betelin, Vladimir Borisovich—doctor of physical mathematical sciences.

Bilenko, Anton Petrovich—doctor of technical sciences, professor.

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Glivenko, Yelena Valeryevna—doctor of technical sciences, professor.

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Gorbatov, Vyacheslav Afanasyevich—doctor of technical sciences, professor.

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Grigoryants, Vil Valentinovich—doctor of physical mathematical sciences, professor.

Dolkart, Vladimir Mikhaylovich—doctor of technical sciences.

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Lapiy, Viktor Yuryevich—doctor of technical sciences, professor.

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Domrachev, Georgiy Alekseyevich—doctor of chemical sciences, professor.

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Dyumayev, Kirill Mikhaylovich—doctor of chemical sciences, professor.

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Glebovitskiy, Viktor Andreyevich—doctor of geological mineralogical sciences.

Godovikov, Aleksandr Aleksandrovich—doctor of geological mineralogical sciences, professor.

Gokhberg, Mikhail Borisovich—doctor of physical mathematical sciences, professor.

Gritsenko, Aleksandr Ivanovich—doctor of technical sciences, professor.

Dedeyev, Vladimir Alekseyevich—doctor of geological mineralogical sciences, professor.

Dmitriyevskiy, Anatoliy Nikolayevich—doctor of geological mineralogical sciences, professor.

Dobrynin, Valeriy Makarovich—doctor of geological mineralogical sciences, professor.

Drits, Viktor Anatolyevich—doctor of geological mineralogical sciences, professor.

Yershov, Vadim Viktorovich—doctor of technical sciences, professor.

Yershov, Eduard Dmitriyevich—doctor of geological mineralogical sciences, professor.

Zhamoyda, Aleksandr Ivanovich—doctor of geological mineralogical sciences, professor.

Zharkov, Vladimir Naumovich—doctor of physical mathematical sciences, professor.

Zheltov, Yuriy Petrovich—doctor of technical sciences, professor.

Zakirov, Sumbat Nabiyevich—doctor of technical sciences, professor.

Zelinskiy, Igor Petrovich—doctor of geological mineralogical sciences, professor.

Ziangirov, Rem Sabirovich—doctor of geological mineralogical sciences, professor.

Zonenshayn, Lev Pavlovich—doctor of geological mineralogical sciences.

Zorin, Andrey Nikitich—doctor of technical sciences, professor.

Kazantseva, Tamara Timofeyevna—doctor of geological mineralogical sciences.

Kalinin, Arkadiy Vasilyevich—doctor of physical mathematical sciences, professor.

Knipper, Andrey Lvovich—doctor of geological mineralogical sciences.

Kormiltsev, Valeriy Viktorovich—doctor of geological mineralogical sciences.

Koronovskiy, Nikolay Vladimirovich—doctor of geological mineralogical sciences.

Krasheninnikov, Valeriy Arkadyevich—doctor of geological mineralogical sciences.

Krylov, Nikolay Alekseyevich—doctor of geological mineralogical sciences, professor.

Kuznetsov, Oleg Leonidovich—doctor of technical sciences, professor.

Kuznetsov, Sergey Vasilyevich—doctor of technical sciences, professor.

Lutts, Boris Georgiyevich—doctor of geological mineralogical sciences.

Malovitskiy, Yankir Pankhusovich—doctor of geological mineralogical sciences, professor.

Markov, Mark Solomonovich—doctor of geological mineralogical sciences, professor.

Marfunin, Arnold Sergeyevich—doctor of geological mineralogical sciences, professor.

Meyyer, Vladimir Aleksandrovich—doctor of geological mineralogical sciences, professor.

Melnikov, Nikolay Nikolayevich—doctor of technical sciences, professor.

Mineyev, Dmitriy Andreyevich—doctor of geological mineralogical sciences, professor.

Mirzadzhanzade, Azat Khalilovich—academician of the Azerbaijan SSR Academy of Sciences.

Mironenko, Valeriy Aleksandrovich—doctor of geological mineralogical sciences, professor.

Mitrofanov, Feliks Petrovich—doctor of geological mineralogical sciences.

Moralev, Valeriy Mikhaylovich—doctor of geological mineralogical sciences.

Mossakovskiy, Aleksandr Aleksandrovich—doctor of geological mineralogical sciences.

Mikhin, Leonid Kuzmich—doctor of technical sciences.

Nalivkina, Elmira Borisovna—doctor of geological mineralogical sciences.

Neprochnov, Yuriy Pavlovich—doctor of physical mathematical sciences, professor.

Neruchev, Sergey Germanovich—doctor of geological mineralogical sciences, professor.

Nikitin, Lev Vasilyevich—doctor of physical mathematical sciences, professor.

Nikolayev, Aleksey Vsevolodovich—doctor of physical mathematical sciences, professor.

Osipov, Viktor Ivanovich—doctor of geological mineralogical sciences, professor.

Perchuk, Leonid Lvovich—doctor of geological mineralogical sciences, professor.

Pogrevitskiy, Yulian Yevgenyevich—doctor of geological mineralogical sciences.

Poluarshinov, Gennadiy Petrovich—doctor of geological mineralogical sciences, professor.

Pravednikov, Nikolay Konstantinovich—doctor of technical sciences, professor.

Proskuryakov, Nikolay Maksimovich—doctor of technical sciences, professor.

Rezanov, Igor Aleksandrovich—doctor of geological mineralogical sciences.

Rekharskiy, Vladimir Iosifovich—doctor of geological mineralogical sciences, professor.

Rodionov, Vladimir Nikolayevich—doctor of physical mathematical sciences, professor.

Rozanov, Aleksey Yuryevich—doctor of geological mineralogical sciences.

Romankevich, Yevgeniy Aleksandrovich—doctor of geological mineralogical sciences, professor.

Sveshnikov, Gleb Borisovich—doctor of geological mineralogical sciences, professor.

Sedletskiy, Vladimir Ivanovich—doctor of geological mineralogical sciences, professor.

Semenov, Yevgeniy Ivanovich—doctor of geological mineralogical sciences, professor.

Semikhatov, Mikhail Aleksandrovich—doctor of geological mineralogical sciences.

Serov, Viktor Ivanovich—doctor of technical sciences, professor.

Smyslov, Anatoliy Andreyevich—doctor of geological mineralogical sciences, professor.

Sobolev, Gennadiy Aleksandrovich—doctor of physical mathematical sciences, professor.

Sozinov, Nikodim Alekseyevich—doctor of geological mineralogical sciences.

Sorokhtin, Oleg Georgiyevich—doctor of physical mathematical sciences.

Strakhov, Vladimir Nikolayevich—doctor of physical mathematical sciences, professor.

Surguchev, Mikhail Leontyevich—doctor of technical sciences, professor.

Tomson, Ilmar Nikolayevich—doctor of geological mineralogical sciences, professor.

Trifonov, Vladimir Georgiyevich—doctor of geological mineralogical sciences.

Trofimov, Viktor Titovich—doctor of geological mineralogical sciences, professor.

Trubetskoy, Kliment Nikolayevich—doctor of technical sciences, professor.

Urusov, Vadim Sergeyevich—doctor of chemical sciences, professor.

Ustinov, Mikhail Ivanovich—doctor of technical sciences, professor.

Ferronskiy, Vasiliy Ivanovich—doctor of technical sciences, professor.

Khetagurov, Grigoriy Davydovich—doctor of technical sciences, professor.

Kholodov, Vladimir Nikolayevich—doctor of geological mineralogical sciences, professor.

Khramov, Aleksey Nikitich—doctor of physical mathematical sciences, professor.

Chanturiya, Valentin Alekseyevich—doctor of technical sciences, professor.

Cheishchev, Nikolay Fedorovich—doctor of geological mineralogical sciences, professor.

Chuvashov, Boris Ivanovich—doctor of geological mineralogical sciences.

Shebalin, Nikolay Vissarionovich—doctor of physical mathematical sciences, professor.

Sheko, Arkadiy Illarionovich—doctor of geological mineralogical sciences, professor.

Shinkarev, Nikolay Filippovich—doctor of geological mineralogical sciences, professor.

Shukolyukov, Yuriy Aleksandrovich—doctor of chemical sciences, professor.

Shchelokov, Aleksandr Ivanovich—doctor of technical sciences, professor.

Yamshchikov, Valeriy Sergeyevich—doctor of technical sciences, professor.

Yasamanov, Nikolay Aleksandrovich—doctor of geological mineralogical sciences, professor.

The Oceanology, Atmospheric Physics, and Geography Department

Avakyan, Artavazd Babkenovich—doctor of geographical sciences, professor.

Borisenkov, Yevgeniy Panteleymonovich—doctor of physical mathematical sciences, professor.

[illegible]eklich, Maksim Fedorovich—doctor of geological mineralogical sciences, professor.

Velichko, Andrey Alekseyevich—doctor of geographical sciences, professor.

Voyt, Sergey Sergeyevich—doctor of physical mathematical sciences, professor.

Zhitkovskiy, Yuriy Yuryevich—doctor of physical mathematical sciences, professor.

Zotikov, Igor Aleksyevich—doctor of geographical sciences.

Kazanskiy, Aleksandr Borisovich—doctor of physical mathematical sciences.

Kamenkovich, Vladilir Moiseyevich—doctor of physical mathematical sciences, professor.

Kaplin, Pavel Alekseyevich—doctor of geographical sciences, professor.

Kutuza, Boris Georgiyevich—doctor of physical mathematical sciences, professor.

Kuchment, Lev Samuilovich—doctor of physical mathematical sciences, professor.

Lavrov, Sergey Borisovich—doctor of geographical sciences, professor.

Losev, Kim Semenovich—doctor of geographical sciences.

Malevich, Igor Aleksandrovich—doctor of physical mathematical sciences, professor.

Matishov, Gennadiy Grigoryevich—doctor of geographical sciences.

Ozmidov, Rostislav Vsevolodovich—doctor of physical mathematical sciences, professor.

Ostrovskiy, Lev Aronovich—doctor of physical mathematical sciences, professor.

Reteyum, Aleksey Yuryevich—doctor of geographical sciences.

Simonov, Anatoliy Ilich—doctor of geographical sciences, professor.

Smirnov, Nikolay Pavlovich—doctor of geographical sciences, professor.

Targulyan, Viktor Oganesovich—doctor of geographical sciences.

Trofimov, Anatoliy Mikhaylovich—doctor of geographical sciences, professor.

Fedorov, Konstantin Nikolayevich—doctor of physical mathematical sciences, professor.

Tsyban, Alla Viktorovna—doctor of biological sciences.

Chashechkin, Yuliy Dmitriyevich—doctor of physical mathematical sciences, professor.

Shiklomanov, Igor Alekseyevich—doctor of geographical sciences, professor.

Yastrebov, Vyacheslav Semenovich—doctor of technical sciences, professor.

The History Department

Ado, Anatoliy Vasilyevich—doctor of historical sciences, professor.

Aleksandrov, Vadim Aleksandrovich—doctor of historical sciences.

Arutyunov, Sergey Aleksandrovich—doctor of historical sciences.

Arutyunyan, Yuriy Vartanovich—doctor of historical sciences, professor.

Akhramovich, Roman Timofeyevich—doctor of historical sciences, professor.

Bolkhovitinov, Nikolay Nikolayevich—doctor of historical sciences.

Bolshakov, Oleg Georgiyevich—doctor of historical sciences.

Borisov, Yuriy Stepanovich—doctor of historical sciences, professor.

Bruk, Solomon Ilich—doctor of geographical sciences, professor.

Buganov, Viktor Ivanovich—doctor of historical sciences, professor.

Buniyatov, Ziya Musayevich—academician of the Azerbaijan SSR Academy of Sciences.

Vasilyev, Aleksey Mikhaylovich—doctor of historical sciences.

Vinogradov, Vladilen Nikolayevich—doctor of historical sciences, professor.

Vodarskiy, Yaroslav Yevgenyevich—doctor of historical sciences.

Gadzhiyev, Vladilen Gadisovich—doctor of historical sciences, professor.

Golubtsova, Yelena Sergeyevna—doctor of historical sciences.

Gorskiy, Anatoliy Dmitriyevich—doctor of historical sciences, professor.

Grashchenkov, Viktor Nikolayevich—doctor of art criticism, professor.

Grekov, Igor Borisovich—doctor of historical sciences.

Gurevich, Aron Yakovlevich—doctor of historical sciences, professor.

Dandamayev, Magomed Abdul-Kadyrovich—doctor of historical sciences, professor.

Danilov, Viktor Petrovich—doctor of historical sciences.

Drobizhev, Vladimir Zinovyevich—doctor of historical sciences, professor.

Yeroshkin, Nikolay Petrovich—doctor of historical sciences, professor.

Zubov, Aleksandr Aleksandrovich—doctor of historical sciences, professor.

Ivanov, Robert Fedorovich—doctor of historical sciences, professor.

Ioffe, Genrikh Zinovyevich—doctor of historical sciences.

Islamov, Tofik Muslim ogly—doctor of historical sciences.

Ismagilova, Roza Nurgaleyevna—doctor of historical sciences.

Its, Rudolf Ferdinandovich—doctor of historical sciences, professor.

Kalitina, Nina Nikolayevna—doctor of art criticism, professor.

Kapitsa, Mikhail Stepanovich—doctor of historical sciences, professor.

Karasev, Viktor Georgiyevich—doctor of historical sciences, professor.

Karpov, Sergey Pavlovich—doctor of historical sciences.

Kasyanenko, Vasiliy Ignatyevich—doctor of historical sciences, professor.

Kashtanov, Sergey Mikhaylovich—doctor of historical sciences.

Kinzhalov, Rostislav Vasilyevich—doctor of historical sciences.

Kinyapina, Nina Stepanovna—doctor of historical sciences, professor.

Kirpichnikov, Anatoliy Nikolayevich—doctor of historical sciences.

Kiryan, Mikhail Mitrofanovich—doctor of military sciences, professor.

Koval, Boris Iosifovich—doctor of historical sciences, professor.

Kozlov, Viktor Ivanovich—doctor of historical sciences, professor.

Kuzeyev, Rail Gumerovich—doctor of historical sciences, professor.

Kuzishchin, Vasiliy Ivanovich—doctor of historical sciences, professor.

Kumanev, Viktor Aleksandrovich—doctor of historical sciences, professor.

Kuropyatnik, Gennadiy Petrovich—doctor of historical sciences.

Kucherenko, Gennadiy Semenovich—doctor of historical sciences, professor.

Kyzlasov, Leonid Romanovich—doctor of historical sciences, professor.

Kychanov, Yevgeniy Ivanovich—doctor of historical sciences, professor.

Levshin, Boris Venediktovich—doctor of historical sciences.

Leyberov, Igor Pavlovich—doctor of historical sciences, professor.

Leskov, Aleksandr Mikhaylovich—doctor of historical sciences.

Libman, Mikhail Yakovlevich—doctor of art criticism.

Litavrin, Gennadiy Grigoryevich—doctor of historical sciences.

Lopukhov, Boris Removich—doctor of historical sciences.

Malkov, Viktor Leonidovich—doctor of historical sciences, professor.

Martynov, Anatoliy Ivanovich—doctor of historical sciences, professor.

Masson, Vadim Mikhaylovich—doctor of historical sciences, professor.

Mashkin, Mikhail Nikolayevich—doctor of historical sciences.

Milov, Leonid Vasilyevich—doctor of historical sciences, professor.

Mylnikov, Aleksandr Sergeyevich—doctor of historical sciences, professor.

Myasnikov, Vladimir Stepanovich—doctor of historical sciences, professor.

Nezhinskiy, Leonid Nikolayevich—doctor of historical sciences.

Pavlov, Vladimir Ivanovich—doctor of historical sciences, professor.

Pak, Mikhail Nikolayevich—doctor of historical sciences, professor.

Pimenov, Vladimir Vladimirovich—doctor of historical sciences, professor.

Plimak, Yevgeniy Grigoryevich—doctor of historical sciences.

Podobedova, Olga Ilinichna—doctor of historical sciences.

Pozharskaya, Svetlana Petrovna—doctor of historical sciences.

Pozdeyeva, Lidiya Vasilyevna—doctor of historical sciences.

Polevoy, Vadim Mikhaylovich—doctor of historical sciences, professor.

Preobrazhenskiy, Aleksandr Aleksandrovich—doctor of historical sciences, professor.

Protopopov, Anatoliy Sergeyevich—doctor of historical sciences, professor.

Proektor, Daniil Mikhaylovich—doctor of historical sciences, professor.

Pryakhin, Anatoliy Dmitriyevich—doctor of historical sciences, professor.

Puchkov, Pavel Ivanovich—doctor of historical sciences, professor.

Rzheshevskiy, Oleg Aleksandrovich—doctor of historical sciences, professor.

Sakharov, Andrey Nikolayevich—doctor of historical sciences.

Seleznev, Georgiy Konstantinovich—doctor of historical sciences, professor.

Semiryaga, Mikhail Ivanovich—doctor of historical sciences, professor.

Simoniya, Nodari Aleksandrovich—doctor of historical sciences, professor.

Sipols, Vilnis Yanovich—doctor of historical sciences, professor.

Sikharulidze, Yuriy Moiseyevich—doctor of historical sciences, professor.

Skrynnikov, Ruslan Grigoryevich—doctor of historical sciences, professor.

Smirnova, Nina Dmitriyevna—doctor of historical sciences.

Sobolev, Gennadiy Leontyevich—doctor of historical sciences, professor.

Sogrin, Vladimir Viktorovich—doctor of historical sciences, professor.

Solovyev, Oleg Fedorovich—doctor of historical sciences.

Spirin, Leonid Mikhaylovich—doctor of historical sciences, professor.

Startsev, Vitaliy Ivanovich—doctor of historical sciences, professor.

Sternin, Grigoriy Yuryevich—doctor of art criticism.

Tishkov, Valeriy Aleksandrovich—doctor of historical sciences.

Trukan, German Antonovich—doctor of historical sciences, professor.

Undasynov, Iskander Nurtasovich—doctor of historical sciences, professor.

Fedorov, Vladimir Aleksandrovich—doctor of historical sciences, professor.

Florya, Boris Nikolayevich—doctor of historical sciences.

Fursenko, Aleksandr Aleksandrovich—doctor of historical sciences.

Khalikov, Alfred Khasanovich—doctor of historical sciences, professor.

Khromov, Semen Spiridonovich—doctor of historical sciences, professor.

Chubaryan, Aleksandr Oganovich—doctor of historical sciences, professor.

Shvidkovskiy, Oleg Aleksandrovich—doctor of historical sciences, professor.

Shelestov, Dmitriy Kuzmich—doctor of historical sciences.

Skirokov, Gleriy Kuzmich—doctor of economic sciences, professor.

Shishkin, Valeriy Aleksandrovich—doctor of historical sciences, professor.

Shkaratan, Ovsey Irmovich—doctor of historical sciences, professor.

Shmidt, Sigurd Ottovich—doctor of historical sciences, professor.

Shchapov, Yaroslav Nikolayevich—doctor of historical sciences.

Yazhborovskaya, Inessa Sergeyevna—doctor of historical sciences.

Yazkov, Yevgeniy Fedorovich—doctor of historical sciences, professor.

The Philosophy and Law Department

Abdullayev, Magomed Abdulayevich—doctor of philosophical sciences, professor.

Aitov, Nariman Abdrakhmanovich—doctor of philosophical sciences, professor.

Anufriyev, Yevgeniy Aleksandrovich—doctor of philosophical sciences, professor.

Arefyeva, Galina Sergeyevna—doctor of philosophical sciences, professor.

Babosov, Yevgeniy Mikhaylovich—corresponding member of the Belorussian SSR Academy of Sciences.

Bagramov, Eduard Aleksandrovich—doctor of philosophical sciences, professor.

Barabashev, Georgiy Vasilyevich—doctor of juridical sciences, professor.

Barulin, Vladimir Semenovich—doctor of philosophical sciences, professor.

Bestuzhev-Lada, Igor Vasilyevich—doctor of historical sciences, professor.

Bikkenin, Nail Bariyevich—doctor of philosophical sciences.

Blishchenko, Igor Pavlovich—doctor of juridical sciences, professor.

Bratus, Sergey Nikitich—doctor of juridical sciences, professor.

Brutyan, Georg Abelovich—academician of the Armenian SSR Academy of Sciences.

Buyeva, Lyudmila Panteleyevna—doctor of philosophical sciences, professor.

Burlatskiy, Fedor Mikhaylovich—doctor of philosophical sciences, professor.

Butenko, Anatoliy Pavlovich—doctor of philosophical sciences, professor.

Vasilyev, Andrey Mikhaylovich—doctor of juridical sciences, professor.

Vereshchetin, Vladilen Stepanovich—doctor of juridical sciences, professor.

Volkogonov, Dmitriy Antonovich—doctor of philosophical sciences, professor.

Gorskiy, Dmitriy Pvalovich—doctor of philosophical sciences, professor.

Gribanov, Veniamin Petrovich—doctor of juridical sciences, professor.

Grigoryan, Boris Tigranovich—doctor of philosophical sciences, professor.

Grushin, Boris Andreyevich—doctor of philosophical sciences, professor.

Guliyev, Vladimir Yevgenyevich—doctor of juridical sciences, professor.

Dobrenkov, Vladimir Ivanovich—doctor of philosophical sciences, professor.

Zotov, Anatoliy Fedorovich—doctor of philosophical sciences, professor.

Ivanov, Vilen Nikolayevich—doctor of philosophical sciences, professor.

Karpets, Igor Ivanovich—doctor of juridical sciences, professor.

Kon, Igor Semenovich—doctor of philosophical sciences, professor.

Kositsyn, Aleksandr Pavlovich—doctor of juridical sciences, professor.

Kuznetsov, Vitaliy Nikolayevich—doctor of philosophical sciences, professor.

Kuzmin, Vsevolod Petrovich—doctor of philosophical sciences.

Kuptsov, Vladimir Ivanovich—doctor of philosophical sciences, professor.

Lazarev, Boris Mikhaylovich—doctor of juridical sciences, professor.

Lapin, Nikolay Ivanovich—doctor of philosophical sciences, professor.

Lektorskiy, Vladislav Aleksandrovich—doctor of philosophical sciences, professor.

Marakhov, Vladimir Grigoryevich—doctor of philosophical sciences, professor.

Markaryan, Eduard Sarkisovich—doctor of philosophical sciences, professor.

Mchedlov, Miran Petrovich—doctor of philosophical sciences, professor.

Nersesyants, Vladik Sumbatovich—doctor of juridical sciences, professor.

Osipov, Gennadiy Vasilyevich—doctor of philosophical sciences, professor.

Pletnikov, Yuriy Konstantinovich—doctor of philosophical sciences, professor.

Popov, Sergey Ivanovich—doctor of philosophical sciences, professor.

Rakitov, Anatoliy Ilich—doctor of philosophical sciences, professor.

Sadikov, Oleg Nikolayevich—doctor of juridical sciences, professor.

Sadovskiy, Vadim Nikolayevich—doctor of philosophical sciences, professor.

Sachkov, Yuriy Vladimirovich—doctor of philosophical sciences, professor.

Semenov, Vadim Sergeyevich—doctor of philosophical sciences, professor.

Semenov, Yuriy Ivanovich—doctor of historical sciences, professor.

Smirnov, Igor Nikolayevich—doctor of philosophical sciences, professor.

Sokolov, Vasiliy Vasilyevich—doctor of philosophical sciences, professor.

Staroverov, Vladimir Ivanovich—doctor of philosophical sciences, professor.

Stepin, Vyacheslav Semenovich—doctor of philosophical sciences, professor.

Stolyarov, Vladislav Ivanovich—doctor of philosophical sciences, professor.

Topornin, Boris Nikolayevich—doctor of juridical sciences, professor.

Toshchenko, Zhan Terentyevich—doctor of philosophical sciences, professor.

Tumanov, Vladimir Aleksandrovich—doctor of juridical sciences, professor.

Ursul, Arkadiy Dmitriyevich—academician of the Moldavian SSR Academy of Sciences.

Filippov, Fridrikh Rafailovich—doctor of philosophical sciences, professor.

Chistyakov, Oleg Ivanovich—doctor of juridical sciences, professor.

Shakhnazarov, Georgiy Khosroyevich—doctor of juridical sciences.

Shubkin, Vladimir Nikolayevich—doctor of philosophical sciences, professor.

Yusupov, Erkin—academician of the Uzbek SSR Academy of Sciences.

Yakovlev, Aleksandr Maksimovich—doctor of juridical sciences, professor.

Yanovskiy, Rudolf Grigoryevich—doctor of philosophical sciences, professor.

The Economics Department

Aperyan, Vladimir Yeremeyevich—doctor of economic sciences, professor.

Belousov, Rem Aleksandrovich—doctor of economic sciences, professor.

Belchuk, Aleksandr Ivanovich—doctor of economic sciences, professor.

Bushuyev, Boris Sergeyevich—doctor of economic sciences, professor.

Bykov, Oleg Nikolayevich—doctor of historical sciences, professor.

Verba, Prokofiy Ivanovich—doctor of economic sciences, professor.

Gelbras, Vilya Gdalivich—doctor of historical sciences, professor.

Danilov-Danilyan, Viktor Ivanovich—doctor of economic sciences, professor.

Dashichev, Vyacheslav Ivanovich—doctor of historical sciences, professor.

Yevstigneyev, Ruben Nikolayevich—doctor of economic sciences, professor.

Yegiazaryan, Gevork Ashotovich—doctor of economic sciences, professor.

Yershov, Stal Aleksandrovich—doctor of historical sciences, professor.

Ivanov, Ivan Dmitriyevich—doctor of economic sciences, professor.

Karpukhin, Dmitriy Nikolayevich—doctor of economic sciences, professor.

Kirichenko, Vadim Nikitovich—doctor of economic sciences, professor.

Kokoshin, Andrey Afanasyevich—doctor of historical sciences, professor.

Komin, Anatoliy Nikolayevich—doctor of economic sciences.

Kuzin, Boris Ivanovich—doctor of economic sciences, professor.

Lavrikov, Yuriy Aleksandrovich—doctor of economic sciences, professor.

Lebedev, Viktor Georgiyevich—doctor of economic sciences, professor.

Lemeshev, Mikhail Yakovlevich—doctor of economic sciences, professor.

Loginov, Viktor Petrovich—doctor of economic sciences, professor.

Lvov, Dmitriy Semenovich—doctor of economic sciences, professor.

Martynov, Vladlen Arkadyevich—doctor of economic sciences, professor.

Mikulskiy, Konstantin Ivanovich—doctor of economic sciences, professor.

Moskvin, Dmitriy Dmitriyevich—doctor of economic sciences, professor.

[illegible]amutrov, Vilen Leonidovich—doctor of economic sciences, professor.

Popov, Gavriil Kharitonovich—doctor of economic sciences, professor.

Radayev, Valeriy Viktorovich—doctor of economic sciences, professor.

Rakitskiy, Boris Vasilyevich—doctor of economic sciences, professor.

Rimashevskaya, Natalya Mikhaylovna—doctor of economic sciences, professor.

Rybin, Valeriy Ivanovich—doctor of economic sciences, professor.

Smirnitskiy, Yevgeniy Konstantinovich—doctor of economic sciences, professor.

Stanis, Vladimir Frantsevich—doctor of economic sciences, professor.

Tishchenko, Viktor Yeliseyevich—doctor of economic sciences, professor.

Faminskiy, Igor Pavlovich—doctor of economic sciences, professor.

Fedoseyev, Vladimir Anatolyevich—doctor of economic sciences, professor.

Fridman, Leonid Abramovich—doctor of economic sciences, professor.

Shastitko, Vladimir Mikhaylovich—doctor of economic sciences, professor.

Sheremet, Anatoliy Danilovich—doctor of economic sciences, professor.

Shmelev, Nikolay Petrovich—doctor of economic sciences, professor.

Yakovets, Yuriy Vladimirovich—doctor of economic sciences, professor.

Yaremenko, Yuriy Vasilyevich—doctor of economic sciences, professor.

Yasin, Yevgeniy Grigoryevich—doctor of economic sciences, professor.

The Literature and Language Department

Averintsev, Sergey Sergeyevich—doctor of philological sciences.

Andreyev, Leonid Grigoryevich—doctor of philological sciences, professor.

Andreyev, Yuriy Andreyevich—doctor of philological sciences.

Apresyan, Yuriy Derenikovich—doctor of philological sciences.

Bondarko, Aleksandr Vladimirovich—doctor of philological sciences, professor.

Bondarko, Liya Vasilyevna—doctor of philological sciences, professor.

Borev, Yuriy Borisovich—doctor of philological sciences, professor.

Byalik, Boris Aronovich—doctor of philological sciences, professor.

Vardul, Igor Fridrikhovich—doctor of philological sciences, professor.

Volkova, Zlata Nikolayevna—doctor of philological sciences.

Vomperskiy, Valentin Pavlovich—doctor of philological sciences, professor.

Gadzhiyeva, Ninel Zeynalovna—doctor of philological sciences, professor.

Gak, Vladimir Grigoryevich—doctor of philological sciences, professor.

Gey, Nikolay Konstantinovich—doctor of philological sciences.

Golovnin, Ivan Vasilyevich—doctor of philological sciences, professor.

Goreglyad, Vladislav Nikanorovich—doctor of philological sciences.

Grigoryev, Viktor Petrovich—doctor of philological sciences.

Grintser, Pavel Aleksandrovich—doctor of philological sciences.

Gryunberg-Tsvetinovich, Aleksandr Leonovich—doctor of philological sciences, professor.

Denisov, Petr Nikitich—doctor of philological sciences, professor.

Dmitriyev, Yuriy Arsenyevich—doctor of art criticism, professor.

Domashnev, Anatoliy Ivanovich—doctor of philological sciences, professor.

Dybo, Vladimir Antonovich—doctor of philological sciences.

Yegorov, Boris Fedorovich—doctor of philological sciences, professor.

Yershov, Leonid Fedorovich—doctor of philological sciences, professor.

Zhuravlev, Vladimir Konstantinovich—doctor of philological sciences, professor.

Zakiyev, Mirkhatykh Zakiyevich—doctor of philological sciences, professor.

Zaliznyak, Andrey Anatolyevich—doctor of philological sciences, professor.

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Zemskaya, Yelena Andreyevna—doctor of philological sciences.

Zograf, Georgiy Aleksandrovich—doctor of philological sciences.

Ivanov, Valeriy Vasilyevich—doctor of philological sciences, professor.

Ivanov, Sergey Nikolayevich—doctor of philological sciences, professor.

Karpushin, Vladimir Alekseyevich—doctor of philological sciences, professor.

Karkhu, Eyno Genrikhovich—doctor of philological sciences.

Klimov, Georgiy Andreyevich—doctor of philological sciences.

Kolesov, Vladimir Viktorovich—doctor of philological sciences, professor.

Konen, Valentina Dzhozefovna—doctor of art criticism.

Kotelova, Nadezhda Zakharovna—doctor of philological sciences.

Krivonosov, Aleksey Timofeyevich—doctor of philological sciences, professor.

Kuznetsov, Feliks Feodosyevich—doctor of philological sciences, professor.

Kuleshov, Vasiliy Ivanovich—doctor of philological sciences, professor.

Kumakhov, Mukhadin Abubekirovich—doctor of philological sciences, professor.

Lebedev, Konstantin Aleksandrovich—doctor of philological sciences, professor.

Leontyev, Aleksey Alekseyevich—doctor of philological and psychological sciences, professor.

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Lopatin Vladimir Vladimirovich—doctor of philological sciences, professor.

Lotman, Yuriy Mikhaylovich—doctor of philological sciences, professor.

Lukin, Yuriy Andreyevich—doctor of philosophical sciences, professor.

Martynov, Viktor Vladimirovich—doctor of philological sciences, professor.

Maslov, Yuriy Sergeyevich—doctor of philological sciences, professor.

Matveyev, Aleksandr Konstantinovich—doctor of philological sciences, professor.

Meletinskiy, Yeleazar Moiseyevich—doctor of philological sciences.

Mikushev, Anatoliy Konstantinovich—doctor of philological sciences, professor.

Moiseyev, Aleksandr Ivanovich—doctor of philological sciences, professor.

Mokiyenko, Valeriy Mikhaylovich—doctor of philological sciences, professor.

Musayev, Kenesbay Musayevich—doctor of philological sciences, professor.

Naydakov, Vasiliy Tsyrenovich—doctor of philological sciences, professor.

Neroznak, Vladimir Petrovich—doctor of philological sciences.

Nestyev, Izrail Vladimirovich—doctor of art criticism, professor.

Nikolskiy, Leonid Borisovich—doctor of philological sciences, professor.

Nikolskiy, Sergey Vasilyevich—doctor of philological sciences, professor.

Ovcharenko, Aleksandr Ivanovich—doctor of philological sciences, professor.

Osmanov, Magomed-Nuri Osmanovich—doctor of philological sciences, professor.

Pavlovskiy, Aleksey Ilich—doctor of philological sciences.

Panchenko, Aleksandr Mikhaylovich—doctor of philological sciences, professor.

Petrov, Nikolay Yegorovich—doctor of philological sciences.

Piotrovskiy, Raymond Genrikhovich—doctor of philological sciences, professor.

Putilov, Boris Nikolayevich—doctor of philological sciences.

Riftin, Boris Lvovich—doctor of philological sciences.

Robinson, Andrey Nikolayevich—doctor of philological sciences.

Sarabyanov, Dmitriy Vladimirovich—doctor of art criticism, professor.

Semenyuk, Natalya Nikolayevna—doctor of philological sciences.

Serebryakov, Yevgeniy Aleksandrovich—doctor of philological sciences, professor.

Skatov, Nikolay Nikolayevich—doctor of philological sciences, professor.

Sorokoletov, Fedor Pavlovich—doctor of philological sciences, professor.

Subbotin, Aleksandr Sergeyevich—doctor of philological sciences, professor.

Tvorogov, Oleg Viktorovich—doctor of philological sciences.

Ulukhanov, Igor Stepanovich—doctor of philological sciences, professor.

Umarkhodzhayev, Mukhtar Ishankhodzhayevich—doctor of philological sciences, professor.

Urnov, Dmitry Mikhaylovich—doctor of philological sciences.

Fomichev, Sergey Aleksandrovich—doctor of philological sciences.

Khalidov, Anas Bakiyevich—doctor of philological sciences, professor.

Khorev, Viktor Aleksandrovich—doctor of philological sciences.

Tsitsishvili, Georgiy Shalvovich—corresponding member of the Georgian SSR Academy of Sciences.

Sharbatov, Grigoriy Shamilevich—doctor of philological sciences, professor.

Shveytser, Aleksandr Davidovich—doctor of philological sciences, professor.

Shcherbak, Aleksandr Mikhaylovich—doctor of philological sciences.

The Far Eastern Department

Ageyev, Mikhail Dmitriyevich—doctor of technical sciences.

Akulichev, Viktor Anatolyevich—doctor of physical mathematical sciences, professor.

Borukayev, Chermen Beybulatovich—doctor of geological mineralogical sciences.

Bykovtsev, Gennadiy Ivanovich—doctor of physical mathematical sciences, professor.

Voloshin, Gennadiy Yakovlevich—doctor of technical sciences, professor.

Glushchenko, Viktor Yuryevich—doctor of chemical sciences, professor.

Govorov, Ivan Nikolayevich—doctor of geological mineralogical sciences, professor.

Zdor, Vladimir Vasilyevich—doctor of technical sciences, professor.

Druzhinin, Igor Petrovich—doctor of geographical sciences, professor.

Kolesnikov, Pavel Mikheyevich—doctor of technical sciences, professor.

Korobeynikov, Viktor Pavlovich—doctor of physical mathematical sciences, professor.

Kuznetsov, Nikolay Vasilyevich—doctor of physical mathematical sciences, professor.

Ler, Pavel Andreyevich—doctor of biological sciences, professor.

Moiseyenko, Valentin Grigoryevich—doctor of geological mineralogical sciences, professor.

Myasnikov, Veniamin Petrovich—doctor of physical mathematical sciences, professor.

Nekrasov, Ivan Yakovlevich—doctor of geological mineralogical sciences, professor.

Perchuk, Viktor Lvovich—doctor of technical sciences, professor.

Pisarenko, Valeriy Georgiyevich—doctor of physical mathematical sciences.

Sidorov, Anatoliy Alekseyevich—doctor of geological mineralogical sciences, professor.

Khrapatyy, Nikolay Grigoryevich—doctor of technical sciences, professor.

Khudyakov, Gleb Ivanovich—doctor of geological mineralogical sciences, professor.

Cherepanov, Gennadiy Petrovich—doctor of physical mathematical sciences, professor.

The Siberian Department

Alekseyev, Veniamin Vasilyevich—doctor of historical sciences, professor.

Andreyev, Gennadiy Vladimirovich—doctor of geological mineralogical sciences, professor.

Annin, Boris Dmitriyevich—doctor of physical mathematical sciences, professor.

Afonin, Valeriy Petrovich—doctor of technical sciences, professor.

Bagayev, Sergey Nikolayevich—doctor of physical mathematical sciences.

Bayev, Vladimir Konstantinovich—doctor of technical sciences, professor.

Bgatov, Vasiliy Ivanovich—doctor of geological mineralogical sciences, professor.

Belousov, Anatoliy Fedorovich—doctor of geological mineralogical sciences.

Bichenkov, Yevgeniy Ivanovich—doctor of physical mathematical sciences, professor.

Bobko, Igor Maksimovich—corresponding member of the USSR Academy of Pedagogical Sciences.

Boyko, Vladimir Ivanovich—doctor of philosophical sciences, professor.

Bugayev, Sergey Petrovich—doctor of technical sciences, professor.

Bulavskiy, Vladimir Aleksandrovich—doctor of physical mathematical sciences, professor.

Burshteyn, Anatoliy Izrailevich—doctor of physical mathematical sciences, professor.

Vasilyevskiy, Ruslan Sergeyevich—doctor of historical sciences.

Vakhitov, Gadel Galyautdinovich—doctor of technical sciences, professor.

Vlasov, Valentin Viktorovich—doctor of chemical sciences.

Volchkov, Eduard Petrovich—doctor of technical sciences, professor.

Votakh, Oleg Aliyevich—doctor of geological mineralogical sciences, professor.

Vragov, Vladimir Nikolayevich—doctor of physical mathematical sciences, professor.

Gabuda, Svyatoslav Petrovich—doctor of physical mathematical sciences, professor.

Goldshtik, Mikhail Aleksandrovich—doctor of physical mathematical sciences, professor.

Goncharov, Sergey Savostyanovich—doctor of physical mathematical sciences, professor.

Goryushkin, Leonid Mikhaylovich—doctor of historical sciences, professor.

Grachev, Mikhail Aleksandrovich—doctor of chemical sciences.

Gritsko, Gennadiy Ignatyevich—doctor of technical sciences, professor.

Gurman, Vladimir Iosifovich—doctor of technical sciences, professor.

Dementyev, Vladimir Tikhonovich—doctor of physical mathematical sciences, professor.

Deribas, Andrey Andreyevich—doctor of physical mathematical sciences, professor.

Yevsikov, Vadim Ivanovich—doctor of biological sciences.

Yeliseyev, Sergey Viktorovich—doctor of technical sciences, professor.

Zharkov, Mikhail Abramovich—doctor of geological mineralogical sciences, professor.

Zherebtsov, Geliy Aleksandrovich—doctor of physical mathematical sciences.

Zhidomirov, Georgiy Mikhaylovich—doctor of physical mathematical sciences, professor.

Zagoruyko, Nikolay Grigoryevich—doctor of technical sciences, professor.

Zelenyak, Tadey Ivanovich—doctor of physical mathematical sciences, professor.

Zemskov, Stanislav Valerianovich—doctor of chemical sciences, professor.

Zorin, Yuliy Aleksandrovich—doctor of geological mineralogical sciences, professor.

Ivanov, Vasiliy Nikolayevich—doctor of historical sciences, professor.

Ignatchenko, Valter Alekseyevich—doctor of physical mathematical sciences, professor.

Igoshin, Nikolay Vitalyevich—doctor of economic sciences, professor.

Ilin, Valeriy Pavlovich—doctor of physical mathematical sciences, professor.

Kabanov, Mikhail Vsevolodovich—doctor of physical mathematical sciences, professor.

Kazhikhov, Aleksandr Vasilyevich—doctor of physical mathematical sciences, professor.

Kazanskiy, Yuriy Petrovich—doctor of geological mineralogical sciences, professor.

Karpov, Igor Konstantinovich—doctor of geological mineralogical sciences, professor.

Karelin, Aleksandr Ivanovich—doctor of technical sciences, professor.

Karliner, Marlen Moiseyevich—doctor of physical mathematical sciences, professor.

Kedrinskiy, Valeriy Kirillovich—doctor of physical mathematical sciences, professor.

Kovalchuk, Boris Mikhaylovich—doctor of technical sciences.

Kovenya, Viktor Mikhaylovich—doctor of physical mathematical sciences, professor.

Konovalov, Anatoliy Nikolayevich—doctor of physical mathematical sciences, professor.

Kontorovich, Aleksey Emilyevich—doctor of geological mineralogical sciences, professor.

Koropachinskiy, Igor Yuryevich—doctor of biological sciences, professor.

Kostylev, Aleksandr Dmitriyevich—doctor of technical sciences, professor.

Kotov, Vadim Yevgenyevich—doctor of physical mathematical sciences, professor.

Kruglyakov, Eduard Pavlovich—doctor of physical mathematical sciences.

Krylov, Sergey Vasilyevich—doctor of geological mineralogical sciences, professor.

Krymskiy, Germogen Filippovich—doctor of physical mathematical sciences, professor.

Kuznetsov, Yevgeniy Aleksandrovich—doctor of physical mathematical sciences, professor.

Kuzmin, Mikhail Ivanovich—doctor of geological mineralogical sciences.

Kuleshov, Valeriy Vladimirovich—doctor of economic sciences, professor.

Kurlenya, Mikhail Vladimirovich—doctor of technical sciences, professor.

Kutateladze, Semen Samsonovich—doctor of physical mathematical sciences.

Larionov, Vladimir Petrovich—doctor of technical sciences, professor.

Larichev, Vitaliy Yepifanovich—doctor of historical sciences.

Leonov, Sergey Borisovich—doctor of technical sciences, professor.

Letnikov, Feliks Artemyevich—doctor of geological mineralogical sciences, professor.

Mazalov, Lev Nikolayevich—doctor of physical mathematical sciences, professor.

Mazurov, Viktor Danilovich—doctor of physical mathematical sciences, professor.

Makushkin, Yuriy Semenovich—doctor of physical mathematical sciences, professor.

Melnikov, Vladimir Pavlovich—doctor of geological mineralogical sciences.

Minin, Vladilen Fedorovich—doctor of technical sciences, professor.

Mironov, Boris Petrovich—doctor of technical sciences, professor.

Mironov, Valeriy Leonidovich—doctor of physical mathematical sciences, professor.

Mironosetskiy, Nikolay Borisovich—doctor of technical sciences, professor.

Mitrofanov, Vladislav Vladimirovich—doctor of physical mathematical sciences, professor.

Mikhaylenko, Boris Grigoryevich—doctor of physical mathematical sciences.

Molodin, Vyacheslav Ivanovich—doctor of historical sciences.

Monakhov, Valentin Nikolayevich—doctor of physical mathematical sciences, professor.

Neizvestnyy, Iog Georgiyevich—doctor of physical mathematical sciences, professor.

Nemirovskiy, Yuriy Vladimirovich—doctor of physical mathematical sciences.

Nechepurenko, Mikhail Ivanovich—doctor of physical mathematical sciences, professor.

Nigmatulin, Robery Iskandrovich—doctor of physical mathematical sciences, professor.

Nifontov, Vladimir Ivanovich—doctor of technical sciences.

Ovsyuk, Viktor Nikolayevich—doctor of physical mathematical sciences.

Oleynikov, Boris Vasilyevich—doctor of geological mineralogical sciences.

Patashinskiy, Aleksandr Zakharovich—doctor of physical mathematical sciences, professor.

Penenko, Vladimir Viktorovich—doctor of physical mathematical sciences, professor.

Pokrovskiy, Nikolay Nikolayevich—doctor of historical sciences, professor.

Ponomarev, Yevgeniy Aleksandrovich—doctor of physical mathematical sciences, professor.

Ponomarenko, Arnold Grigoryevich—doctor of physical mathematical sciences, professor.

Popov, Aleksandr Kuzmich—doctor of physical mathematical sciences, professor.

Preobrazhenskiy, Nikolay Georgiyevich—doctor of physical mathematical sciences, professor.

Pukhnachev, Vladislav Vasilyevich—doctor of physical mathematical sciences, professor.

Rebrov, Aleksey Kuzmich—doctor of physical mathematical sciences, professor.

Reverdatto, Vladimir Viktorovich—doctor of geological mineralogical sciences.

Revuzhenko, Aleksandr Filippovich—doctor of physical mathematical sciences.

Rogozin, Boris Alekseyevich—doctor of physical mathematical sciences, professor.

Romanov, Vladimir Gavrilovich—doctor of physical mathematical sciences, professor.

Ryashentsev, Nikolay Pavlovich—doctor of technical sciences, professor.

Sagdeyev, Renad Zinnurovich—doctor of chemical sciences.

Salimov, Rustam Abelyevich—doctor of technical sciences.

Salikhov, Kev Minullinovich—doctor of physical mathematical sciences, professor.

Svitashev, Konstantin Konstantinovich—doctor of physical mathematical sciences, professor.

Sinitsa, Stanislav Platonovich—doctor of physical mathematical sciences.

Smirnov, Leonid Stepanovich—doctor of physical mathematical sciences, professor.

Sokolov, Veniamin Sergeyevich—doctor of physical mathematical sciences, professor.

Solovyev, Vladimir Aliyevich—doctor of geological mineralogical sciences, professor.

Solomonov, Nikita Gavrilovich—doctor of biological sciences, professor.

Suvernev, Vitaliy Grigoryevich—doctor of technical sciences, professor.

Sukhanov, Anatoliy Pavlovich—doctor of philosophical sciences, professor.

Tvorogov, Stanislav Dmitriyevich—doctor of physical mathematical sciences.

Torgov, Vladislav Germanovich—doctor of chemical sciences.

Trofimov, Boris Aleksandrovich—doctor of chemical sciences, professor.

Fomin, Vasiliy Mikhaylovich—doctor of physical mathematical sciences, professor.

Fofanov, Vladimir Pavlovich—doctor of philosophical sciences, professor.

Kholkin, Anatoliy Ivanovich—doctor of chemical sciences.

Khoroshevskiy, Viktor Gavrilovich—doctor of technical sciences, professor.

Tsarev, Vladimir Petrovich—doctor of geological mineralogical sciences.

Tselishchev, Vitaliy Valentinovich—doctor of philosophical sciences, professor.

Chaplik, Aleksandr Vladimirovich—doctor of physical mathematical sciences, professor.

Chernov, Oleg Ignatyevich—doctor of technical sciences, professor.

Shabanov, Vasiliy Filippovich—doctor of physical mathematical sciences, professor.

Sharapov, Viktor Nikolayevich—doctor of geological mineralogical sciences, professor.

Shestakov, Ivan Pavlovich—doctor of physical mathematical sciences, professor.

Shmakin, Boris Matveyevich—doctor of geological mineralogical sciences, professor.

Shteyngarts, Vitaliy Davidovich—doctor of chemical sciences, professor.

Shcherbakov, Yuriy Gavrilovich—doctor of geological mineralogical sciences, professor.

Yakovkin, Igor Borisovich—doctor of technical sciences.

Yakovlev, Viktor Leontyevich—doctor of technical sciences.

Yakupov, Vil Saydelyevich—doctor of geological mineralogical sciences, professor.

The Ural Department

Avrorin, Yevgeniy Nikolayevich—doctor of physical mathematical sciences.

Alekseyev, Sergey Sergeyevich—doctor of juridical sciences, professor.

Antsiferov, Vladimir Nikitovich—doctor of technical sciences, professor.

Vershinin, Yuriy Nikolayevich—doctor of technical sciences, professor.

Vyatkin, German Platonovich—doctor of chemical sciences, professor.

Gubanov, Vladimir Aleksandrovich—doctor of chemical sciences, professor.

Zhukovskiy, Vladimir Mikhaylovich—doctor of chemical sciences, professor.

Zeldovich, Boris Yakovlevich—doctor of physical mathematical sciences.

Izyumov, Yuriy Aleksandrovich—doctor of physical mathematical sciences, professor.

Kalashnikov, Mikhail Timofeyevich—doctor of technical sciences.

Kamaletdinov, Murat Abdulkhakovich—doctor of geological mineralogical sciences, professor.

Klotsman, Semen Moiseyevich—doctor of physical mathematical sciences.

Klyachkin, Yuriy Stepanovich—doctor of technical sciences, professor.

Kozlov, Leonid Nikolayevich—doctor of technical sciences, professor.

Konovalov, Aleksey Afanasyevich—doctor of technical sciences, professor.

Koroteyev, Viktor Alekseyevich—doctor of geological mineralogical sciences.

Leontyev, Leopold Igoryevich—doctor of technical sciences.

Lipanov, Aleksey Matveyevich—doctor of technical sciences, professor.

Makarov, Viktor Matveyevich—doctor of technical sciences.

Moshev, Valeriy Varfolomeyevich—doctor of technical sciences, professor.

Men, Aron Naumovich—doctor of chemical sciences, professor.

Okunev, Arkadiy Ivanovich—doctor of technical sciences, professor.

Pastukhov, Eduard Andreyevich—doctor of chemical sciences.

Pashkevich, Kazimir Iosifovich—doctor of chemical sciences, professor.

Rakhmankulov, Dilyus Lutfullich—doctor of chemical sciences, professor.

Roshchevskiy, Mikhail Pavlovich—doctor of biological sciences, professor.

Ryabin, Viktor Afanasyevich—doctor of technical sciences, professor.

Sidorov, Anatoliy Fedorovich—doctor of physical mathematical sciences, professor.

Skripov, Vladimir Pavlovich—doctor of physical mathematical sciences, professor.

Smirnov, Leonid Andreyevich—doctor of technical sciences, professor.

Suyetin, Parigoriy Yevstafyevich—doctor of physical mathematical sciences, professor.

Trapeznikov, Viktor Aleksandrovich—doctor of technical sciences, professor.

Fotiyev, Albert Arkadyevich—doctor of chemical sciences, professor.

Tsidilkovskiy, Isaak Mikhaylovich—doctor of physical mathematical sciences, professor.

Chupakhin, Oleg Nikolayevich—doctor of chemical sciences, professor.

Shavrin, Sergey Viktorovich—doctor of technical sciences, professor.

Shimanov, Sergey Nikanorovich—doctor of physical mathematical sciences, professor.

Shchebrin, Vitaliy Yevgenyevich—doctor of technical sciences, professor.

Yushkin, Nikolay Pavlovich—doctor of geological mineralogical sciences, professor.

Yatsenko, Sergey Pavlovich—doctor of chemical sciences, professor.

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Organizational, Personnel Changes at USSR Academy of Sciences

18140117 Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 9, Sep 87 pp 142-143

[Article under the rubric "News Items and Information": "Scientific Organizational Decisions of the Presidium of the USSR Academy of Sciences"]

[Text] The Institute of Structural Macrokinetics of the USSR Academy of Sciences (ISMAN) with the corresponding design and technological services, an experimental works, pilot plants, and an educational center for the training of specialists was established within the General and Technical Chemistry Department of the USSR Academy of Sciences at the Noginsk Scientific Center of the USSR Academy of Sciences. The basic directions of the scientific activity of the institute were approved. Doctor of Physical Mathematical Sciences A.G. Merzhanov was approved as direction of the Institute of Structural Macrokinetics of the USSR Academy of Sciences.

The Institute of Water and Ecological Problems of the Siberian Department of the USSR Academy of Sciences was established in Barnaul on the basis of the Laboratory of Ecology and the Efficient Use of Nature of the Institute of Geography, the Laboratory of Water Problems of the Institute of Geology and Geophysics imeni 60-letiya Soyuza SSR, the Laboratory of Hydrophysics and Ecology of Reservoirs of the Institute of Hydrodynamics imeni M.A. Lavrentyev, the Barnaul Economic Laboratory of the Institute of Economics and Organization of Industrial Production, and the Laboratory of Water Resource Problems of the Siberian Power Engineering Institute of the Siberian Department of the USSR Academy of Sciences.

The basic directions of the scientific activity of the institute were approved. The scientific and scientific methods supervision of the institute was assigned to the Oceanology, Atmospheric Physics, and Geography Department of the USSR Academy of Sciences jointly with the General Biology Department of the USSR Academy of Sciences. Corresponding Member of the USSR Academy of Sciences O.F. Vasilyev was appointed director of the Institute of Water and Ecological Problems of the Siberian Department of the USSR Academy of Sciences.

The Laboratory of Socioeconomic Problems of Scientific and Technical Progress of the Institute of Socioeconomic Problems of the Development of the Agroindustrial Complex of the USSR Academy of Sciences was organized in Ulyanovsk. The basic directions of the scientific research of the laboratory were approved.

The Laboratory of the Conservation and Restoration of Documents of the USSR Academy of Sciences was included in the Archive of the USSR Academy of Sciences as a structural subdivision. The basic scientific directions—the elaboration of scientific problems of the restoration and conservation of documents and practical work in this area—were retained for the laboratory.

The republic Tungus State Meteorite Reserve was organized for a period of 20 years on the territory of Tungussko-Chunskiy Rayon of the Evenki Autonomous Okrug of Krasnoyarsk Kray on an area of 250,000 hectares. The supervision of scientific research, the coordination of work on forest biology problems, and the monitoring of the observance of conditions on the territory of the Tungus State Meteorite Reserve were assigned to the Institute of Forestry and Timber imeni V.N. Sukachev of the Siberian Department of the USSR Academy of Sciences.

The journal *Programmirovaniye* of the USSR Academy of Sciences was transferred from the Mathematics Department of the USSR Academy of Sciences to the Information Science, Computer Technology, and Automation Department of the USSR Academy of Sciences.

Academician O.M. Belotserkovskiy was relieved of the duties of chairman of the Scientific Council of the USSR Academy of Sciences for the Complex Problem "Cybernetics." O.M. Belotserkovskiy was thanked for many years of fruitful activity on the development of cybernetics and computer technology in the USSR in the position of chairman of this council.

Academician A.P. Yershov was approved as chairman of the Scientific Council of the USSR Academy of Sciences for the Complex Problem "Cybernetics."

Academician O.M. Belotserkovskiy was approved as director and organizer of the Institute of the Automation of Designing of the USSR Academy of Sciences.

Corresponding Member of the USSR Academy of Sciences M.V. Alfimov was relieved from the performance of the duties of director of the Institute of Chemical Physics of the USSR Academy of Sciences.

Academician Yu.A. Buslayev was relieved of the position of director of the Institute of New Chemical Problems of the USSR Academy of Sciences and was appointed director of the Institute of Chemical Physics of the USSR Academy of Sciences.

Corresponding Member of the USSR Academy of Sciences A.S. Monin was relieved of the duties of director of the Institute of Oceanology imeni P.P. Shirshov of the USSR Academy of Sciences in connection with the expiration of the term of office. The temporary fulfillment of the duties of director of the Institute of Oceanology imeni P.P. Shirshov of the USSR Academy of Sciences was assigned to Doctor of Technical Sciences V.S. Yastrebov, deputy director of the institute.

Doctor of Philosophical Sciences V.S. Stepin was appointed director of the Institute of History of the Natural Sciences and Technology of the USSR Academy of Science.

Academician Yu.Ye. Nesterikhin was relieved of the duties of director of the Institute of Automation and Electrometry of the Siberian Department of the USSR Academy of Sciences. The temporary fulfillment of the duties of director of the institute was assigned to Doctor of Technical Sciences P.Ye. Tverdokhleb.

Doctor of Physical Mathematical Sciences Yu.G. Shafer was relieved of the duties of director of the Institute of Space Physics Research and Aeronomy of the Yakutsk Affiliate of the Siberian Department of the USSR Academy of Sciences at his own request. Doctor of Physical Mathematical Sciences G.F. Krymskiy was appointed director of this institute.

Doctor of Geological Mineralogical Sciences B.V. Oleynikov was appointed director of the Institute of Geology of the Yakutsk Affiliate of the Siberian Department of the USSR Academy of Sciences.

Candidate of Technical Sciences N.A. Azhishchev was appointed head of the Tuva Complex Department of the Siberian Department of the USSR Academy of Sciences.

Doctor of Technical Sciences B.P. Dyakonov was relieved of the duties of director of the Institute of Geophysics of the Ural Department of the USSR Academy of Sciences and of the duties of deputy chairman of the Presidium of the Ural Department of the USSR Academy of Sciences at his own request.

Candidate of Geological Mineralogical Sciences V.P. Parnachev was relieved of the position of director of the Ilmenskiy State Reserve imeni V.I. Lenin of the Ural Department of the USSR Academy of Sciences at his own request. Doctor of Geological Mineralogical Sciences V.N. Anfilogov was appointed director of the Ilmenskiy State Reserve imeni V.I. Lenin of the Ural Department of the USSR Academy of Sciences.

Doctor of Geological Mineralogical Sciences V.A. Sokolov was relieved of the duties of director of the Institute of Geology of the Karelian Affiliate of the USSR Academy of Sciences in connection with his retirement. Doctor of Geological Mineralogical Sciences S.I. Rybakov was approved as director of the Institute of Geology

of the Karelian Affiliate of the USSR Academy of Sciences and as a member of the Presidium of the Karelian Affiliate of the USSR Academy of Sciences.

Academician Ye.P. Velikhov was relieved of the duties of chairman of the Council of the USSR Academy of Sciences for the Automation of Scientific Research. Academician Yu.V. Gulyayev was approved as chairman of the Council of the USSR Academy of Sciences for the Automation of Scientific Research.

Corresponding Member of the USSR Academy of Sciences A.A. Makarov was approved as chairman of the Scientific Council of the USSR Academy of Sciences for Complex Problems of Power Engineering. The organizational support and material and technical supply of the Scientific Council of the USSR Academy of Sciences for Complex Problems of Power Engineering were assigned to the Institute of Power Engineering Research of the USSR Academy of Sciences and the USSR State Committee for Science and Technology.

Corresponding Member of the USSR Academy of Sciences E.R. Tenishev was approved as chairman of the Soviet Committee of Turkologists.

Doctor of Technical Sciences A.K. Romanov was approved as deputy chief scientific secretary of the Presidium of the USSR Academy of Sciences by way of transfer from the USSR State Committee for Science and Technology.

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Development, Introduction of Industrial Lasers

18140080 Moscow KHIMICHESKOYE I NEFTYANOYE MASHINOSTROYENIYE in Russian No 9, Sep 87 pp 45-46—FOR OFFICIAL USE ONLY

[Article by Galym Abilsiitov, general director of the Tekhnologicheskiye lazery Interbranch Scientific Technical Complex, under the rubric "Inquiries and Consultations": "The 'Occupations' of the Laser Beam"; reprinted from *Press-Byulleten Sekretariata SEV*, Moscow, No 8, 1987; first three paragraphs are *Press-Byulleten Sekretariata SEV* introduction]

[Text] At present about 20 interbranch scientific technical complexes are operating in the national economy of the Soviet Union. Their task is to perform work over the entire cycle—from research to the introduction of the obtained results in production. Scientific institutions, planning and design bureaus, and industrial enterprises have been brought together in "one strike force" in order to go through this cycle as quickly as possible.

One such complex is the Tekhnologicheskiye lazery Complex. It is the main organization within the Comprehensive Program of Scientific and Technical Progress for the problem "The Development of New Technologies of the Working of Materials With the Use of Laser Processes."

Galym Abilsiitov, general director of the Tekhnologicheskiye lazery Interbranch Scientific Technical Complex, tells about the activity of the interbranch scientific technical complex and its relations with partners.

The basic direction of the work of the complex is the development and series production of laser equipment for the heat treatment of materials. In scientific laboratories and under industrial conditions technological methods of cutting, welding, heat hardening, surfacing, and so on are undergoing checking. An extensive set of powerful lasers, diagnostic and technological equipment, instruments, and automation equipment makes it possible to quickly and efficiently conduct research and solve practical problems.

The laser is a land-based and general-purpose tool in many sectors of the national economy. It bears energy which is sufficient for the heating, melting, and vaporization of any substances, which are quick and limited in space. Its beam does not have a force effect on metal. By means of optical systems it can be easily aimed at any spot of a part.

A laser with a power of about 1 kilowatt is capable of productively cutting steels and various alloys, plastics and composites, glass, ceramics, and much more.

Laser hardening is often used for increasing the operating life of parts in assemblies of friction couples. As a rule, it is sufficient to harden just small zones—the working surfaces, in order to obtain a sharp increase of performance. Staff members of the interbranch scientific technical complex developed a number of standard designs of the self-hardening of steels, cast irons, and several alloys and devised special types of lasers and technological complexes for heat treatment. These units are intended for use first of all at motor vehicle, automobile and tractor, machine tool building, and other enterprises.

Laser beam welding has its own peculiarities and advantages. The quantity of heat, which is fed in this case into the metal, is much less than in case of arc welding, while the speed is many fold greater. The weld has a small width with a great depth, moreover, the strength parameters of the part in practice do not decrease.

A typical peculiarity of laser technological complexes is a high degree of automation. Precisely this also ensures extensive prospects of technology of this sort in industry.

A special service, which is gathering information and reference material and is forming an automated bank of data, which reflect the latest achievements of domestic and foreign technology, is being established at the Tekhnologicheskiye lazery Interbranch Scientific Technical Complex.

The processing of available information materials shows that laser equipment is experiencing today a period of rapid development. Its predicted growth rate during the next 5 years will exceed the average increase of the production of computers. This is explained by the high efficiency and output-capital ratio from introduction. The recovery of expenditures here comes to 1-3 years. The volumes of production of laser equipment testify that a new sector of industry, which during the next decade will be developed to a scale comparable to electronics, has emerged.

At the same time in the CEMA member countries with respect to a large number of items a gap exists between the needs and the volume of output being produced. Many units and systems, which are being produced in the USSR and other socialist states, do not conform to the present qualitative level and require additional development and assimilation. That is why at the 42d meeting of the CEMA Session it was decided to devote more attention to laser devices. As is known, they have been included in the Comprehensive Program of Scientific and Technical Progress in the form of two problems. The Lazernaya tekhnika Interbranch Scientific Technical Complex is dealing with the first of them, the Scientific Research Center for Technological Lasers of the USSR Academy of Sciences is dealing with the second one—"The Development and Introduction of Laser Equipment and Technology."

The implementation of the outlined measures will make it possible to increase the qualitative level of laser equipment, to bring in line the production volumes and the increasing needs of the national economy of the CEMA member country, and in so doing to decrease the expenditures.

In late 1986 Bulgaria, Hungary, the GDR, Poland, the USSR, and the CSSR signed agreements on scientific and technical cooperation on the second problem and on scientific, technical, and production cooperation on the first one. They stipulate that the organizations of the CEMA member countries, which are participating in the work, on the basis of bilateral and multilateral agreements and contracts will begin the cooperative and specialized development and production of components of laser equipment and technological complexes. Close integration with allowance made for traditional specialization will make it possible to provide most efficiently and quickly the required qualitative and quantitative level.

Technological and intermittent pulsed lasers and automated technological complexes for cutting, surface hardening, machining to size, and welding are included in the list of equipment being developed. Particular emphasis will be placed on the production of high quality assemblies and components of the design of lasers with the use of advanced technologies and microprocessors and on the assurance of high operating characteristics, first of all the life, stability, and the convenience and easy of use.

What kind of impact do we expect from the implementation of the program?

First of all labor productivity in industry will increase substantially: in welding and cutting operations—by two- to fourfold, while in the broaching of holes—by three- to sixfold. The labor intensity of technological processes and at the same time the expenditures of energy and material resources will decrease. The quality of materials and items will increase significantly. The life of parts will be increased due to the use of the methods of laser hard facing, the deposition of films, and surface alloying. The proportion of manual labor will decrease and the standards of production will improve.

On the basis of cooperation within CEMA it is proposed to develop a large number of models of laser equipment and instruments. Thus, we will produce solid state lasers with an average power of up to 1 kilowatt jointly with the Czechoslovak Monokrystal Plant and a standard series of 150-, 400, and 800-watt lasers with the combine of precision mechanics in the city of Halle (the GDR). A test batch of medical laser units will be produced in cooperation with the Hungarian TUNGSRAM Association.

In all 155 joint jobs have to be completed. As a result during 1987-1990 more than 20 systems of the monitoring and control of technological processes in industry will appear. Among them are laser displacement meters, range finders, and systems of the laying out and checking of the dimensions of machine building parts. Their producers have already been specified. The devices will be series produced by 1990. Enterprises of Bulgaria, Hungary, and the USSR are taking an active part in this.

It is also planned to develop highly efficient technological lasers and automated complexes with an increased operating life and a high degree of reliability, to organize their extensive industrial production, and to develop new technological processes, having determined the limits of their efficiency.

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Organizational, Personnel Changes at USSR Academy of Sciences

18140127 Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 10, Oct 87 pp 135-136

[Article under the rubric "News Items and Information": "Scientific Organizational Decisions of the Presidium of the USSR Academy of Sciences"]

[Text] The Department of Problems of Machine Building of the affiliate of the Institute of Machine Science imeni A.A. Blagonravov of the USSR Academy of Sciences in Saratov was organized in Volgograd. The basic directions of the scientific activity of the department were approved.

The Commission of the USSR Academy of Sciences for Problems of Transportation attached to the Problems of Machine Building, Mechanics, and Control Processes Department of the USSR Academy of Sciences was organized. The scientific and scientific methods supervision of the Commission of the USSR Academy of Sciences for Problems of Transportation is being carried out by the Problems of Machine Building, Mechanics, and Control Processes Department jointly with the Physical Technical Problems of Power Engineering Department, the Information Science, Computer Technology, and Automation Department, and the Economics Department of the USSR Academy of Sciences.

The performance of the duties of chairman of the Commission of the USSR Academy of Sciences for Problems of Transportation has been assigned to Academician Ye.A. Fedosov.

In connection with the organization of the Commission of the USSR Academy of Sciences for Problems of Transportation the Joint Scientific Council of the USSR Academy of Sciences for Problems of Transportation and the Scientific Council of the USSR Academy of Sciences for Complex Problems of Promising Means of Transportation and Transportation Power Engineering, the Scientific Council of the USSR Academy of Sciences for the Complex Problem of the Unified Transportation System of the USSR, and the Scientific Council of the USSR Academy of Sciences for the Complex Problem of the Management of Transportation Processes, which were included in it, were abolished.

Academician G.A. Avsyuk was relieved of the duties of deputy chairman of the Earth Sciences Section of the Presidium of the USSR Academy of Sciences in accordance with his personal request. Academician G.A. Avsyuk was thanked for many years of fruitful work as deputy chairman of the Earth Sciences Section of the Presidium of the USSR Academy of Sciences.

Doctor of Physical Mathematical Sciences A.B. Zhizhchenko was appointed deputy academician secretary of the Mathematics Department of the USSR Academy of Sciences for scientific organizational questions with his freeing from the duties of scientific secretary of the Mathematics Department of the USSR Academy of Sciences.

Doctor of Technical Sciences V.A. Filippov was appointed deputy academician secretary of the Physical Technical Problems of Power Engineering Department of the USSR Academy of Sciences for scientific organizational questions.

Doctor of Chemical Sciences V.V. Kurashev was appointed deputy academician secretary of the General and Technical Chemistry Department of the USSR Academy of Sciences for scientific organizational questions.

Corresponding Member of the USSR Academy of Medical Sciences V.I. Medvedev was appointed deputy academician secretary of the Physiology Department of the USSR Academy of Sciences for scientific organizational questions.

Doctor of Geographical Sciences V.G. Neyman was appointed deputy academician secretary of the Oceanology, Atmospheric Physics, and Geography Department of the USSR Academy of Sciences for scientific organizational questions.

Academician V.M. Tuchkevich was relieved of the duties of director of the Physical Technical Institute imeni A.F. Ioffe of the USSR Academy of Sciences at his own request. Academician V.M. Tuchkevich was thanked for many years of fruitful management of the institute.

Academician Zh.I. Alferov was appointed director of the Physical Technical Institute imeni A.F. Ioffe of the USSR Academy of Sciences.

Corresponding Member of the USSR Academy of Sciences M.M. Koton was relieved of the position of director of the Institute of High Molecular Compounds of the USSR Academy of Sciences at his own request. M.M. Koton was thanked for many years of fruitful activity in this post.

Doctor of Chemical Sciences Ye.F. Panarin was appointed director of the Institute of High Molecular Compounds of the USSR Academy of Sciences.

Academician V.A. Koptyug was appointed director of the Novosibirsk Institute of Organic Chemistry of the Siberian Department of the USSR Academy of Sciences.

Corresponding Member of the USSR Academy of Sciences M.V. Mokhosoyev was relieved of the duties of chairman of the Presidium of the Buryat Affiliate of the Siberian Department of the USSR Academy of Sciences in connection with the expiration of the term of office

and of the duties of director of the Buryat Institute of the Natural Sciences of the Buryat Affiliate of the Siberian Department of the USSR Academy of Sciences at his own request.

Corresponding Member of the USSR Academy of Sciences N.L. Dobretsov was appointed Chairman of the Presidium of the Buryat Affiliate of the Siberian Department of the USSR Academy of Sciences.

Corresponding Member of the USSR Academy of Sciences M.N. Babushkin was relieved of the duties of director of the Khabarovsk Complex Scientific Research Institute of the Far Eastern Department of the USSR Academy of Sciences in connection with the expiration of the term of office.

Doctor of Geographical Sciences I.P. Druzhinin was appointed director of the Khabarovsk Complex Scientific Research Institute of the Far Eastern Department of the USSR Academy of Sciences.

Doctor of Geological Mineralogical Sciences V.A. Sokolov was relieved of the duties of chairman of the Presidium of the Karelian Affiliate of the USSR Academy of Sciences in connection with his retirement.

Doctor of Technical Sciences I.M. Nesterenko was appointed chairman of the Presidium of the Karelian Affiliate of the USSR Academy of Sciences.

Academician P.G. Kostyuk was approved as editor in chief of the journal *Uspekhi Fiziologicheskikh Nauk* of the USSR Academy of Sciences.

Academician P.G. Kostyuk was relieved of the duties of editor in chief of the journal *Neyrofiziologiya* of the USSR Academy of Sciences and the Ukrainian SSR Academy of Sciences in connection with the expiration of the term of office. P.G. Kostyuk was thanked for the successful management of this journal.

Academician of the Ukrainian SSR Academy of Sciences V.I. Skok was approved as editor in chief of the journal *Neyrofiziologiya*.

Academician N.P. Bekhtereva was relieved of the duties of editor in chief of the journal *Fiziologiya Cheloveka* of the USSR Academy of Sciences in connection with the expiration of the term of office. N.P. Bekhtereva was thanked for the successful management of the journal.

Corresponding Member of the USSR Academy of Medical Sciences V.I. Medvedev was approved as editor in chief of the journal *Fiziologiya Cheloveka*.

Academician V.I. Goldanskiy was approved as editor in chief of the journal *Khimicheskaya fizika* of the USSR Academy of Sciences with his freeing from the duties of editor in chief of the journal *Khimiya Vysokikh Energiy* of the USSR Academy of Sciences.

Academician Ye.M. Sergeyev was relieved of the duties of editor in chief of the journal *Inzhenernaya Geologiya* of the USSR Academy of Sciences at his own request. Ye.M. Sergeyev was thanked for many years of fruitful activity in this post.

Doctor of Geological Mineralogical Sciences V.I. Osipov was approved as editor in chief of the journal *Inzhenernaya Geologiya*.

Doctor of Historical Sciences V.V. Sogrin was approved as editor in chief of the editorial board of *Obshchestvennyye Nauki i Sovremennost* of the USSR Academy of Sciences.

Academician of the Azerbaijan SSR Academy of Sciences M.Sh. Shiraliyev was relieved of the duties of editor in chief of the journal *Sovetskaya Tyurkologiya* of the USSR Academy of Sciences and the Azerbaijan SSR Academy of Sciences in connection with the expiration of the term of office. M.Sh. Shiraliyev was thanked for many years of fruitful work in this post.

Corresponding member of the USSR Academy of Sciences E.R. Tenishev was approved as editor in chief of the journal *Sovetskaya Tyurkologiya*.

Corresponding Member of the USSR Academy of Sciences M.F. Zhukov was relieved of the duties of editor in chief of the journal Izvestiya Sibirskogo Otdeleniya AN SSSR at his personal request.

Corresponding Member of the USSR Academy of Sciences F.A. Kuznetsov was approved as editor in chief of the journal *Izvestiya Sibirskogo Otdeleniya AN SSSR*.

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Statements of Participants at Annual General Assembly of Academy

18140019a Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 9, Aug 87 pp 3-64

[Article under the rubric "The Annual General Assembly of the USSR Academy of Sciences": "Statements of the Assembly Participants"[1]]

[Text] Academician Secretary of the General Physics and Astronomy Department Academician A.M. Prokhorov

The January (1987) CPSU Central Committee Plenum showed that restructuring is already yielding positive results, but much work still lies ahead for the achievement of the goals set by the 27th party congress. I will dwell on the activity of the General Physics and Astronomy Department, which is the largest and holds a leading position at the Academy of Sciences.

In a number of directions the work of the institutes of the department is at a leading level, but there are fields that are of great practical importance, in which we lag. A significant lag exists in microelectronics and the development of the element base for it. The institutes, which are dealing with this, in practice are all in the General Physics and Astronomy Department. Here the equipment of our institutes with technological devices and instruments does not satisfy the present requirements.

The tasks of sharply increasing the output of complex microcircuits and developing new promising technologies, including the development of microcircuits with elements of submicron dimensions, have been set for them. For the achievement of these goals it is necessary to settle without delay the question of the equipment of the institutes of the department with modern technological devices and instruments for the development of the element base of microelectronics and computer hardware. Without this the lag will increase, which will affect, for example, the development of optoelectronic devices for fiber optic communications and other applications. Here one should mention the research on the development of optical computers, about which G.I. Marchuk spoke. For the solution of these closely connected problems it is possible to use practically the same technological devices and instruments.

The progress of science is being accompanied by the appearance of new directions. Where is one to get the resources for their development? A ready-made answer exists: cut off unpromising directions. However, in basic research, in contrast to applied research, it is difficult to indicate unpromising directions.

I want to dwell on a very important problem, with which the institutes of our department have been dealing for a long time—the obtaining of materials that have superconductivity at high temperatures. Up to now superconducting materials have operated at the temperature of liquid helium. If a material with a temperature of superconductivity, which corresponds to the temperature of liquid nitrogen, were to be developed, this would lead to a revolution in electrical engineering and would yield an enormous economic impact. Our scientists have engaged in a search for new mechanisms of the formation of superconductivity and in the obtaining of the corresponding materials, including polymer materials.

Recently reports that several ceramic materials have superconductivity at significantly higher temperatures than those known up to now, have arrived from several countries. It is necessary not only to look into the physics of the phenomenon, but also to answer the question of the suitability of these materials for the development of practical systems.

The institutes of the department are making a significant contribution to the scientific and technical progress of our country and to the development of many directions of new technology. It is well known that the extensive introduction of solid-state lasers in technological processes is under way. Such a possibility appeared owing to the fact that our institutes hold a leading position in the world in the obtaining of new effective laser crystals, on the basis of which unique laser systems, including for medicine, have been developed. This work is being successfully performed jointly with various ministries. A number of them intend to produce lasers for their own purposes.

Many laser units, which have been tested in industry, have demonstrated great effectiveness in solving a wide range of technological problems. Here it should be borne in mind that new materials, which can be successfully processed with lasers, are appearing. We should organize the extensive production of laser systems. The future of machine building is inconceivable without the application of laser equipment, the expenditures on which will be recovered. In this connection I will recall that special assets were not allocated to the institutes of our department for the development of solid-state technological lasers, which, of course, did not make it possible to launch work on the necessary scale. We had to count on our own forces. There is the mistaken opinion that it is not particularly necessary to help physicists, they are living well as it is. For example, the institutes of our department in practice are not receiving the latest computer equipment, although they urgently need it.

There is a second example. It is well known that we lag in such a most important field as the development of an extensive network of systems of communication and cable television with the use of optical fibers, although academic institutes have made a decisive contribution to the scientific development of this direction in the country. The lag is connected with the fact that an advanced technology of the commercial production of high quality optical fiber has not been developed—this is a very difficult problem, for the solution of which considerable efforts are required. At present the situation has changed: academic institutes jointly with industry on the basis of the formed interbranch scientific technical complex have acquired the opportunity to organize the production of modern automated units for the production of high quality optical fiber.

Scientific and technical progress requires the development of new directions, while this means that institutes should broaden their themes. The main emphasis here must be placed on the supply of institutes with modern devices and instruments with the maximum automation. This not only will increase labor productivity, but will also improve significantly the quality of the results being obtained. We should take the path of the intensification of scientific labor in industry and science. For the timely introduction in industry of the obtained results additional staff, which we do not have, are required, while sectorial institutes have both good technological equipment and staff, but are not using them efficiently enough.

Academician Ya.B. Zeldovich

In the past decade an enormous step forward has been made in cosmology. We have known for more than 60 years now the size of the observable domain of the universe, we know that it is expanding and know approximately its age and the quantity and density of the matter in it.

In the past quarter century owing to radio astronomy research and the discovery of radio frequency emission, which permeates the universe, we have learned its physical state: in the past it consisted of hot plasma, and galaxies and stars—everything that we observe around ourselves—originated only during expansion and cooling.

But back about 10 years ago the situation in cosmology was as follows: by means of the laws of physics with respect to a specific initial state of the universe we were able to obtain the presently observable picture of the world. But a more profound question arose: Why in the universe is there matter and not antimatter, although the properties of matter and antimatter are nearly identical? Why did plasma in the initial state already have an enormous speed of expansion?

Up until the latest stage of the development of cosmology there was no clear answer to all these "whys" and to the questions of the origin of the initial state of the universe. The understanding of how the initial state of plasma, from which everything that we see around ourselves originated in accordance with well-known laws of physics, could emerge, came about during precisely the last 10 years.

The initial state and the expansion of the universe (as Ye.P. Velikhov already stated in his report) were caused by a massive scalar field. The point is that such a field can be in a state with a negative pressure. According to the present theory of gravitation, namely the general theory of relativity, not only energy, but also pressure have a weight. It turns out that if the pressure is negative, instead of forces of attraction of individual parts of a volume, which is filled with the scalar field, the mutual repulsion of the scalar field, which fills space, arises. This repulsion also creates the initial thrust, that is, causes the high speed of expansion. Later, when the scalar field turns into ordinary types of energy, matter originates. Back in 1967 Academician A.D. Sakharov spoke about the fact that matter is not conserved, that it can decay, while under cosmological conditions it can originate.

I want to emphasize that for the checking of these new concepts on an accelerator energies, which are several million fold greater than the achieved energies, would be required. Therefore, experimentally it will be impossible for a very long time to come to check directly on an accelerator the existence of a massive scalar field or the possibility of the origination of matter. Therefore, cosmology now plays the same kind of role in physics that paleontology plays in living nature. From indirect effects cosmology makes it possible to study processes in the very early universe, which are not accessible to direct observation in the laboratory. In essence, we know only from cosmology that matter can originate and, consequently, decay.

The very subtle effect of quantum fluctuations of the scalar field creates small initial inhomogeneities. It turns our that from the distribution of galaxies in space it is possible to judge the properties of the scalar field, which is inaccessible for direct study. Cosmology requires much computational work and an enormous number of observations. Among them are observations of the distribution of galaxies in three-dimension space, including at large distances. Optical observations (in which the 6-meter telescope is playing a large role) and radio astronomy observations, a significant portion of which should be made with the aid of spacecraft, are needed.

Now the expression has appeared that the universe is "an accelerator for the poor man." Without having a very large accelerator, it is possible to learn much about the behavior of matter at superhigh energies by studying the universe with the aid of cosmology. Americans have told the story of one astrophysics experiment. At first the financing organizations refused to subsidize it. Later they declared that if it had been explained to them that the experiment dealt with the theory of elementary particles, money would have been given immediately.

It is necessary to clearly realize the role of cosmology, which is an astronomical science and at the same time involves the development of the theory of elementary particles and fields, the development of the most fundamental problems of physics.

Academician N.N. Blokhin

On the basis of many statements, which have been heard at the Annual General Assembly, I have gotten the impression that the USSR Academy of Sciences with each year is devoting more and more attention to the problems connected with the study of man, and particularly the problems that are close to medicine.

And this is not by chance. We medical people also believe that very close contact of medical scientists with representatives of other scientific disciplines, particularly physics, chemistry, and engineering, is entirely necessary for the development of medical science and the acceleration of scientific and technical progress in the field of medicine. This is also especially important in connection with the fact that medical science urgently needs today modern technical equipment.

It is necessary to say that during the past period much was done for the assimilation and development of new, primarily diagnostic, equipment that is very important for medicine and is being produced in our country with the joint participation of the USSR Academy of Sciences

and the USSR Academy of Medical Sciences. For example, the first models of calculating and computing tomographs, which are based on nuclear magnetic resonance and X-radiation and are not inferior to foreign models, have been produced. However, they are entering practice very slowly, since the questions of their production have not been settled and for the present it is a matter only of prototypes.

During the period since the April (1985) CPSU Central Committee Plenum and since the 27th CPSU Congress the Academy of Medical Sciences has devoted two sessions to the problems of restructuring in the field of medical science.

We regard as the basic tasks of the present the establishment of large scientific centers which elaborate the most important problems of medicine. This is consistent with the opinion of USSR Minister of Health Ye.I. Chazov, and we expect an increase of the opportunities for the improvement of medical research in our country, which is combined with practice.

During the past year the Tomsk Scientific Center, which unites research on cardiology, oncology, pharmacology, medical genetics, as well as mental health, was opened in the system of the USSR Academy of Medical Sciences.

The All-Union Scientific Center of Radiation Medicine of the USSR Academy of Medical Sciences was established in Kiev.

The Academy of Medical Sciences systematically holds field meetings in the union republics, striving to broaden contacts with the academies of sciences of the union republics and republic scientific institutions of the health care system.

The large amount of basic research, which is being conducted at institutions of the USSR Academy of Sciences, which are close to medicine, was discussed in the report of Academician Yu.A. Ovchinnikov. Apparently, the tasks of the USSR Academy of Medical Sciences are to bring the results of this research closer to practical medicine.

In speaking about several questions that are connected with the most important problems of medical science, I want to dwell on the problem of cardiovascular diseases, from which for the present the largest number of people in our country and in other economically developed countries are dying.

The great gains in this field are connected with the organization of the cardiological service, which to a significant degree was established by the All-Union Cardiological Scientific Center of the Academy of Medical Sciences, which operated in Moscow.

It is necessary to note as a great achievement of Soviet science the development of new thrombolytic preparations, which make it possible to save people from the most serious diseases in case of thromboses of coronary vessels. However, along with this in our country there is a serious lag in the field of heart surgery, and this is creating the need for the establishment of a large number of heart surgery centers throughout the country, which is also being carried out at present by the USSR Ministry of Health.

Aorta-coronary bypass operations, not to mention such operations as heart transplanting, which are widespread in western countries, have received obviously inadequate prevalence. In modern surgery we are devoting much attention to conservative operations. In oncology, owing to the development of nonsurgical methods of treatment, which successfully complement surgery, it has become possible to reject amputations of extremities in case of bone sarcomas, by doing plastic surgery; in many cases of breast cancer disfiguring total mastectomies are being replaced by minor organ-conserving operations.

In stomach ulcer surgery vagotomy is being used extensively in pace of extensive stomach resection.

I would like to speak about the interesting work, which is being performed by Academician N.P. Bekhterova and her associates at the Scientific Research Institute of Experimental Medicine of the USSR Academy of Medical Sciences in Leningrad. In case of several types of blindness they lead directly into the cranial cavity to the optical nerves electrodes which stimulate these nerve branches. Corresponding Member of the USSR Academy of Medical Sciences S.N. Fedorov in a similar manner acted on the optical nerve through the eye socket and also obtained important results.

It is necessary to note the appearance of new approaches to the prevention and treatment of several infectious diseases, particularly viral diseases.

Thus, the USSR Academy of Medical Sciences, while participating in restructuring in the field of medical science, is striving for the strengthening of contacts with the USSR Academy of Sciences, which in the future will also enrich medicine and health care.

[Editorial note] Academician V.I. Goldanskiy addressed those who had gathered as a participant in the Moscow Forum "For the Survival of Mankind, for a Non-Nuclear World," which was held in February 1987. Sympathy and support for the goals, in the name of which well-known American astrophysicist C. Hyder conducted his hunger strike in front of the White House in Washington, were expressed at the forum.

Academician V.I. Goldanskiy

Charles Hyder was born on 18 April 1930 in Albuquerque (New Mexico). He is a veteran of the Korean War, which he himself does not like to recall. In 1958 C. Hyder graduated from the University of New Mexico, where 2 years later he received a master's degree in physics. He received 2 years later a doctoral degree in astrophysics at the University of Colorado. He has five grown children.

During 1964-1970 he was an associate of the Sacramento Peak Observatory in New Mexico, after which he worked for 5 years at NASA on the design of a satellite for studying the activity of the sun. He dealt with the development of an instrument for the measurement of the electromagnetic field in the ultraviolet spectrum. In the opinion of Robert Noyes, a very well-known astrophysicist and astronomy professor of Harvard University, the contribution of Hyder to the study of solar physics is widely recognized among specialists in this field.

Then for 2 years the scientist worked on a contract with the government of the state of Lower Saxony (the FRG), conducting research in the area of environmental protection.

Since the early 1970's C. Hyder has been taking an active part in the antinuclear movement. From 1970 to 1980 he was a member of the Southwest Research and Information Center, a public organization that deals with environmental problems. He was one of the active participants in the protest campaign, which developed during those years in New Mexico, against the plans to turn the salt mines in the state into a dump for radioactive waste. He spoke at public hearings and meetings on other environmental problems. During 1979-1980 he wrote several articles and delivered public reports, in which the safety norms at the Three Mile Island nuclear electric power plant, the neglect of which led in 1979 to the major accident at this nuclear electric power plant, were sharply criticized.

In 1980 the scientist resumed cooperation with NASA, but only on a temporary contract, which had to be renewed every year. NASA did not want to take Hyder on the permanent staff due to his public activity. He quit work at NASA in 1984, when he finally decided to devote his time to the antiwar movement. As C. Hyder says, the bombardment by the battleship New Jersey of Libyan population centers was the event that changed his life. "At that time I thought: enough, this administration is taking a reckless course. Something must be done to prevent a far more terrible threat—nuclear war."

In April 1985 Hyder found himself in Washington, where for the first time he made the acquaintance of participants in the round the clock "antinuclear watch," which was begun in 1981 by a group of Americans in Lafayette Park (across the street from the White House) as a sign of protest against the militaristic policy of the administration. During the following year he gave away all his property and starting in April 1986 joined the "antinuclear watch," living constantly in Lafayette Park. He conducted his first hunger strike, which lasted 32 days, in May-June of the same year.

On 23 September 1986 Charles Hyder announced a new hunger strike, demanding that the U.S. Government assume the obligation to take specific steps on the elimination of nuclear weapons by 2000 and the repudiation of the policy of military interventions abroad.

In speaking about his "system of self-preservation" during this long hunger strike, Hyder explained that in a day he drinks 1-2 gallons of water (that is, 4-8 liters), warm water without fail, so that the body would not consume extra calories on its "warming" to body temperature; another carefully fulfilled condition is the retention of heat.

In the winter due to greatly deteriorated health and the cold weather, which had set in, he was not longer able, as before, to be at his post all the time in Lafayette Park. Since this time the members of the "support group" brought Hyder here once or twice a week, while he spent the rest of the time at apartments of friends. The consequences of the hunger strike are highly conspicuous. A large man of powerful build, he lost half of his former weight. But with "the ridding of excess weight," as he jokingly calls this loss, the inevitable process of muscular atrophy began.

[Editorial note] Further Academician V.I. Goldanskiy read the text of a telegram to Doctor C. Hyder, which was unanimously approved by the General Assembly participants.

Academician V.S. Avduyevskiy

Machine building and the technology of developing machines and obtaining materials are key directions of the national economy, on the progress of which the efficiency of practically all sectors of the production sphere depends. They include the designing and production of complex machines and mechanisms, robotic systems, computers, and control machines, the machining and production of parts, and the obtaining of materials for advanced technologies. Many achievements of basic research of practically all fields of the natural and technical sciences are concentrated and are being used in machine building.

The importance of the performance of basic work in the sector of machine building and technology and its combination with practical applications was stressed at the assembly of the Problems of Machine Building, Mechanics, and Control Processes Department of the USSR Academy of Sciences. The gains made by the institutes of the department in the development of robotic systems, new technological processes, and construction materials, in the development of methods of increasing reliability,

and in the solution of problems of power engineering were covered. The effectiveness of the use of hydrodynamic methods for the obtaining of materials from the liquid or gas phase with improved and new properties was shown. Basic research on shaping in case of the deformation of materials under the conditions of superplasticity and research in the area of friction and lubrication was conducted. G.I. Marchuk in his opening speech has already spoken about the work in the area of engine building.

In a number of statements the members of the Problems of Machine Building, Mechanics, and Control Processes Department spoke in favor of the establishment of a section of the technical sciences, and this suggestion was recorded in the decision of the General Assembly of the department.

After listening to the interesting and substantive reports of the president and vice presidents of the USSR Academy of Sciences I got the impression that the bridge between basic research and production for the present is still not strong enough. In the reports the problems of machine building were touched upon to a negligible degree, but scientific and technical progress is governed by the progress of precisely machine building. I believe that the establishment of a section of the technical sciences will strengthen the contacts between sectorial institutes and special design bureaus, since many executives of these organizations are members of both the Problems of Machine Building, Mechanics, and Control Processes Departments and a number of other departments. Having united all the forces, the section would be able to introduce in industry machine technology and to obtain the final product that is needed.

A certain spontaneous process is being observed: many scientists, who deal with the "pure" sciences, particularly mathematics, are being drawn to the Problems of Machine Building, Mechanics, and Control Processes Department. For example, Academician A.A. Samarskiy attended nearly all the plenary meetings of the 6th All-Union Congress of Mechanical Engineers in Tashkent, since he understands that applied mathematics can be effectively introduced in technology in case of joint work with mechanical engineers. At the last assembly of the Problems of Machine Building, Mechanics, and Control Processes Department 15 academicians and corresponding members of other departments expressed the desire to take part in its work and were accepted by secret ballot. There are applications on the transfer of entire institutes to our department. Specialists understand that their work should have a practical outlet.

The successes of the Ukrainian SSR Academy of Sciences in the field of the technical sciences are connected with the fact that the academy has retained institutes of the technical type. Thus, the Ukrainian SSR Academy of Sciences has more opportunities for the introduction of the results of basic research in practice. By having united the forces of a number of departments of the USSR Academy of Sciences into a section of the technical sciences, we would be taking an important step in the matter of introducing scientific results in industry.

The outstanding scientific research in the area of space research on Venus and Halley's Comet and the study of supernova were correctly noted in the opening speech of Academician G.I. Marchuk and in the reports of Academician Ye.P. Velikhov and V.A. Kotelnikov. But no one mentioned that the designing, production, and development, for example, of the Vega spacecraft, which released a Venus probe and then passed through the gas blanket of the comet, in themselves are most important scientific and technical achievements. The most complex control and guidance instruments were developed for the Vega. For a long time the most precise radio measurements and ballistic calculations were made. And whereas the Institute of Space Research of the USSR Academy of Sciences united scientific forces for the development of the scientific equipment of the Vega Project, Corresponding Member of the USSR Academy of Sciences V.M. Kovtunenko united a collective of designers and specialists of the highest class for the development of the Vega spacecraft.

It is possible to assert that a new field of machine building has appeared—space machine building. Unique spacecraft of the Venera, Vega, and Astron series, orbital near-earth stations, and much more were developed.

In drafting multipurpose scientific plans of space research, which G.I. Marchuk mentioned, we should also take into account the prospects of the development of space machine building, and not only take into account, but also introduce in this field the best technology and materials. The Academy of Sciences should not only supervise scientific developments, which it is doing successfully, but also contribute to the improvement of equipment itself. At the same time feedback is also necessary. The perfection of reliability in the field of space machine building has a number of significant peculiarities, which are connected with the very high demands in case of a relatively small number of models being tested. Therefore, the Nadezhnost Interbranch Scientific Technical Complex under the supervision of Academician K.V. Frolov should unite the experience of not only large-series, but also custom production.

I will also dwell on the technology of obtaining materials. Composites, which are promising for a number of fields of technology, first of all space and aviation technology, are being developed at the Academy of Sciences. But in the aircraft industry they are thus far not being used. The excellent results obtained at institutes of the Academy of Sciences have not reached industry. The same thing is also happening with several alloys. For example, the domestic aircraft industry is receiving in insufficient quantity aluminum-lithium alloy, which is being used throughout the world. It is necessary to forecast promising materials, for this will provide an enormous saving of assets.

Returning to the problems of astronautics, I will note that the Academy of Sciences has lost the taste for them, with the exception of work that serves as an embellishment of domestic science and technology. The journal KOSMONAVTIKA is absolutely necessary. In the United States more than 10 such journal are published, nonspace states also have them. And this is not by chance: astronautics and space machine building require much attention, inasmuch as they are too expensive, the efficiency of their use is often still low, and the poor quality of materials can lead to colossal losses. The journal KOSMONAVTIKA should ensure the exchange of know-how among specialists of the USSR Academy of Sciences and other departments in the area of the development and use of space equipment.

In conclusion I will touch upon satellite communications. In the detailed report of Academician Ye.P. Velikhov on information science the possibilities of satellite communications were not examined. Their use will make it possible to carry out the rapid exchange of data between cities and scientific centers, as well as to use databases for computer-aided design systems. We have experience in such work, therefore, it is necessary merely that the Information Science, Computer Technology, and Automation Department of the USSR Academy of Sciences would regard satellite communications as a mandatory component of the system of information science.

Academician A.M. Obukhov

In the opening speech President of the USSR Academy of Sciences Academician G.I. Marchuk mentioned the difficult, but very important problem of the climate. In contrast to weather forecasts probability approaches and methods should be used in solving it. In essence, an ordinary climatic reference book contains the probabilities of some situations or others. But the point is that the climate, as we know, is not entirely stationary. Specific trends have already emerged, and it is necessary to investigate which of them are natural and which are connected with the activity of man.

The state of research on the theory of the climate of the earth and other planets of the solar system was discussed in the Oceanology, Atmospheric Physics, and Geography Department of the USSR Academy of Sciences. All forecasts are complex and difficult. The basic hardware for the achievement of the goal is satellites, which will make it possible to monitor the parameters of the surface of the planet, the atmosphere, and the ocean. It is necessary to develop remote diagnostic methods, without which the monitoring of the earth as an integral physical system is impossible. Therefore, the problem of the climate and the problem of the environment cannot be a subject of study and a concern of just one department.

It is necessary to give the initiative of G.I. Marchuk, who is devoting much attention to the seminar which id dedicated to the problems of the atmosphere, ocean, and space, its due. It seems to me that in addition to the seminar there should be some other working organ, which will help to coordinate these problems within major scientific and technical programs.

Vice President of the USSR Academy of Sciences Academician V.A. Kotelnikov in his report specified the tasks of physics on two scales: the microcosm and the macrocosm. Whereas elementary or subnuclear particles are assigned to the microcosm, objects the size of a galactic nebula and larger are assigned to the macrocosm. It remained unclear to me: Where do the earth and you and I, its inhabitants, fall—to the microcosm or the macrocosm? It seems to me that one must also not forget the mesoscale, in which we live.

At present space facilities are affording exceptional opportunities for obtaining not only qualitative, but also quantitative information about the atmosphere, the ocean, and the surface of the earth. Moreover, our country in the development of remote methods of studying earth from space holds a leading position. I will recall that associates of the Institute of Radio Engineering and Electronics and the Institute of Atmospheric Physics of the USSR Academy of Sciences made the first observations of earth in the microwave range. However, now a certain lag has emerged in our country in this field of research. Abroad the monitoring of the state of the ocean from satellites is being carried out rather well, in our country for the present only experimental satellites have been developed for this.

Here is another example. It is possible to determine most precisely the temperature of the atmosphere from space by the so-called refractometric method, the method of translucence. This method was applied for the first time in astrophysics to the atmospheres of planets. During observations from a spacecraft cosmonaut G.M. Grechko, now chief of a laboratory of the Institute of Atmospheric Physics, showed that the accuracy of measurements of the temperature of the atmosphere by the method of translucence is no worse than by means of probes, but then the measurements encompass an enormous surface. And still the method of translucence has not become widespread.

And, finally, in our country such means as radar and sonar are being used too little for knowledge of the properties of the atmosphere and in part the ocean. Our country was also the initiator of the introduction of these methods in meteorological observations, but, in spite of the promise and low cost, detection and ranging thus far are not being used extensively in our country. In Sweden, for example, every detector, which ranges clouds, is equipped with a Doppler attachment which measures wind speed.

The foundations of the program on the theory of the climate and environment are now being laid. And in this program theoretical and experimental physics should not only serve as a background, but be an actively working component.

Academician B.N. Ponomarev

In the statements of the president and vice presidents of the USSR Academy of Sciences a detailed description of the work done during the year was given and the tasks for the immediate future were specified. But the times are now special. The 27th CPSU Congress posed the historic task of the acceleration of the socioeconomic development of the country and the correction and elimination of shortcomings, the lag, and mistakes, but many of them have accumulated. The January (1987) CPSU Central Committee Plenum was a direct continuation of the 27th congress and specified the tasks for many years to come.

The Academy of Sciences is called upon to actively participate and is participating in the accomplishment of all these tasks. The range of work of the academy is truly enormous. In this is the embodiment of the behests of V.I. Lenin, who was himself a great scientist and cultivated in the party and Soviet state a love for science. It is worth recalling this during the year of the 70th anniversary of Great October.

I believe that it is entirely possible to endorse the program of work of the Academy of Sciences, which was advanced by the Presidium of the USSR Academy of Sciences, and to actively undertake its implementation in practice.

In the reports the lag was often spoken about. It would be proper and useful for the matter when noting the lag in one section or another of science to suggest steps on overcoming it. It is probably not possible to work this out immediately, but it is necessary to pose such a task without fail.

In our times the importance of the social sciences is increasing. This is occurring for many reasons. The development of socialist society is posing many new tasks both with respect to the socioeconomic base and in the area of the ideological superstructure.

The founders of scientific socialism, K. Marx, F. Engels, and V.I. Lenin, having developed the ideological and theoretical aims and having substantiated the stages of the transition from capitalism to socialism, could not, of course, elaborate all the questions, which life would pose 50-70 years after the victory of the socialist revolution. V.I. Lenin said more than once: we are not setting ourselves such a task. Future generations will specify both the specific steps and the directions of the building of socialism and communism. Our party is also doing this.

The April (1985) CPSU Central Committee Plenum and the 27th party congress, having critically analyzed the preceding period, posed specific tasks. And we see both the ardent approval of this policy by the Soviet people and the need for further active work on the implementation of this policy.

In our nuclear age the processes occurring abroad—in the capitalist countries, first of all, the arms race which has been launched there—are attracting more and more attention.

Whereas from this rostrum we are hearing all the time about the peaceful conquests of space, which are being achieved in our country, abroad the militaristic use of space, the so-called SDI program, is being prepared. And no obstacles are being erected against this. The Pentagon is insisting on the rapid implementation of this program, to which the USSR is opposing a peace-loving Leninist policy.

On the threshold of the General Assembly of the USSR Academy of Sciences the Presidium of the USSR Academy of Sciences posed for scientific collectives the task to specify the priority directions in the basic sciences. The Scientific Council for the Complex Problem "The History of the International Workers' and National Liberation Movement" also received the same kind of assignment. I will dwell briefly on several findings.

At present, at the end of the 20th century, the working class holds a very important place in the population and in the economy of the majority of countries. In all in the world, according to official data, there are 660 million workers, of them in England there are 21 million, or 75 percent of the gainfully employed population, in Japan—35 million, or 69 percent of the population, in the United States—86 million, or 77 percent of the population, in France—20 million, and in the FRG—20 million. Thus, it is possible to say that the working class has potentially enormous strength and enormous opportunities for the expression and defense of its interests, the interests of all working people. But in the nuclear space age it is called upon to defend the interests of all mankind in the matter of saving it from nuclear war and nuclear annihilation.

Here it should be recalled once again that all means of production and consumption are created by the hands of workers. Consequently, all questions, which now worry mankind, are inseparably connected with the fate, the way of thinking, and the activity of the working class and the international workers' movement.

In the socialist countries the working class actively participates in the settlement of all questions. Moreover, it is the vanguard of society, which is taking the path of socialism and the defense of universal peace. In other countries this does not exist. There arises in this connection the question of what the status of the working class in society is and what processes are now occurring in its

midst, in the entire nonsocialist zone of the world. In our age we are faced with the question of how, in what way, and by what means can and should one turn the objectively existing enormous potential of the working class into an active, and in a number of countries a decisive force, which is capable together with the socialist countries of saving mankind from a nuclear missile war and self-destruction and of aiding the settlement of vitally important questions of social development.

But the analysis of the formed situation in the workers' movement shows the very weak role of the worker's movement in the majority of developed capitalist countries both in the campaign against the arms race and the aversion of the threat of nuclear war and in general in the campaign against the aggressive policy of imperialism. The fact that many workers and working people cast their votes in elections for conservatives in England, the FRG, the United States, and a number of other capitalist countries of the West and in Japan, is well known.

However, given the existence of all the indicated factors the working class remains the basic force that is opposing state monopoly capital and its militaristic policy. The working class is conducting a campaign that at times comes to violent class conflicts.

Unfortunately, we see that trade union organization of the working class is very weak. Thus, in the United States it comes to only 18 percent of the number of working people, in France—20 percent, and in Japan—29 percent. Therefore, the study of the processes, which are occurring in the midst of the working class and the international workers' movement, is of great importance. It is called upon to promote the use of the objectively existing potential of the workers' movement and to assist the mobilization of the working masses for a more active campaign against the military danger, the arms race, and militarism and in defense of the rights and gains of the working class and the strengthening of cooperation and the unity of actions among the various detachments of the world workers' movement.

All these questions have a direct bearing on our country and the Soviet people. After all, whether it will be possible to prevent the slide toward a nuclear catastrophe depends on whether social forces, and first of all the working class, will be able to support the peace-loving policy of the USSR. Therefore, in discussing these questions, we came to the conclusion that it is necessary to conduct the research on problems of the world workers' and national liberation movement in the following basic directions: the study of the status of the workers' movement in the nonsocialist zone of the world in order to ascertain the sentiments and positions in the solution of the problems of war and peace for the purpose of strengthening the active antinuclear movement and involving the broadest strata of the population in it; the analysis of the extent of information of workers, working people, and the entire population of foreign countries about the Soviet Union and about the theory and practice of socialism in the USSR; the ascertaining of the possibilities of the workers' movement in the West in order to formulate an alternative to the arms race for the purpose of changing military production over to peacetime output; the study of the status of the working class in capitalist countries, the problem of unemployment, the state of the labor market under the conditions of the scientific and technical revolution, and the relations between labor and capital; the analysis of the class struggle in the capitalist world; the study of the general crisis of capitalism under present conditions.

The conditions of the activity of Communist Parties at present is improving. First of all because the USSR in the past 2 years has appeared with particular force as the bulwark of peace and socialism in the eyes of all the peoples of the earth.

As a whole an all-encompassing, historical struggle over the questions of war and peace is occurring in the world. In recent years our party and General Secretary of the CPSU Central Committee M.S. Gorbachev have launched large-scale and resourceful activity on the prevention of nuclear war, for the survival of mankind, and for the reduction and elimination of nuclear weapons. The chances for success are increasing. The international forum "For a Non-Nuclear World, for the Survival of Mankind," in which many scientists, figures of culture, and representatives of political parties participated, was held in Moscow in February of this year. Its repercussions in all countries were very great.

In the Declaration of M.S. Gorbachev of 28 February 1987 the proposal on eliminating American and Soviet intermediate-range missiles in Europe was advanced. This peaceable proposal is aimed at the elimination of an entire class of nuclear weapons, it opens the way to further reductions. The response to it was very reassuring on the part of both the European governments and the U.S. administration. But the forces opposing nuclear disarmament are very large. The struggle, including over questions of the militarization of space and SDI, will be continued. For the Soviet people it is very important to be well informed about the processes that are occurring in the capitalist countries. Therefore, the role of the institutes of the Academy of Sciences, which deal with international problems, is increasing, they can provide much assistance in the accomplishment of the historic task of the prevention of nuclear war and the saving of civilization.

USSR Minister of Higher and Secondary Specialized Education Corresponding Member of the USSR Academy of Sciences G.A. Yagodin

The Academy of Sciences has now pointed raised the question of scientific replacements. Problems exist here, we sense them nearly everywhere at our scientific institutions and higher educational institutions: a certain generation gap has appeared. This is explained by many

factors. First of all a question arises: Who is a teacher to find a student? It is impossible to do anything by the method of assignment. One can only select and education by oneself a real student. But if one is to select, it is necessary to have an opportunity to work with young people starting with their very first steps in science, already in the process of instruction, in the process of higher education. Good examples exist.

Now at Moscow University Academician V.A. Legasov and Corresponding Member of the USSR Academy of Sciences Yu.D. Tretyakov have given students themes of graduation projects in the 1st year. It was impossible to imagine what enthusiasm this would arouse, what activity would be displayed by young people in research: how many people they have already met, how much literature they have read!

Novosibirsk University, the Moscow Physical Technical Institute, and a number of chairs of other Moscow higher educational institutions—the Institute of Steel and Alloys, the Institute of Chemical Technology imeni D.I. Mendeleyev, and the Institute of Power Engineering—are successfully seeking new forms of work.

But good examples still are not what counts. They also do not determine the overall situation at the higher school. The quality of specialists, unfortunately, today is more and more often defined as average or poor. What is the reason here, where is the mistake, and how is it to be corrected? In June 1986 the CPSU Central Committee submitted for general discussion a plan of the radical reform of the higher school. This is a very promising, in-depth document which is intended for long years. Several decrees of the CPSU Central Committee and the USSR Council of Ministers on specific directions of the improvement of the work of higher educational institutions and the training of specialists have now been adopted on the basis of the analysis of its detailed and comprehensive discussion.

In particular, steps on restoring doctoral studies are envisaged. To afford the opportunity of training doctors of sciences under the supervision of the most prominent scientists—in essence this was also always considered the best version. And this, of course, does not at all signify an aspiration to eliminate "the person on his own," the talented person, who himself has done something within one scientific direction or another.

It is also a question of stimulating the development of scientific schools, of selecting the most talented people for graduate studies, and in so doing of creating for them the conditions and affording them the opportunity to work creatively. On this basis it is also necessary to carry out the radical reorganization of graduate studies. Their geographically uniform distribution about the country began to give rise to students at the rank of graduate students and had the result that more and more often mediocre specialists are preparing dissertations that meet the minimum requirements. This averaging due to geographical distribution is an obvious minus of the present situation. The special-purpose graduate student began to be perceived as a person who enters science all but against his will.

It is necessary to concentrate graduate studies at large leading scientific schools, to keep professors, academicians, and corresponding members of the academies of sciences busy, and to force them to work with all their might, especially as they are now being given the opportunity to select those who will actually display abilities in science, but if they "do not have the longing," after a year to turn them back. In order to create normal opportunities of work in graduate studies, the stipend is being increased. A graduate student, depending on the previous work and the year of instruction in graduate studies, will receive from 110 to 150 rubles.

It is necessary to eliminate completely the conditions, when the scientific supervisor writes dissertations for for his graduate students, knowing that if his graduate student does not defend himself on time, they will not give him the next one, and as a result it will be recorded that the chair did not fulfill the plan.

A number of important steps are also envisaged with respect to undergraduates. Now an undergraduate who does not have any C's will receive a stipend that has been increased by 25 percent, while an undergraduate who gets A's will receive a 50-percent larger stipend, which is already quite substantial. It is now important for us to ensure competitiveness in the process of instruction.

It is not urgent now to speak about the number of specialists. We have provided the needed number of specialists in the country, their quality is the question. We do not have enough good specialists, and you will not make up for this shortage by the number. Therefore, wherever we cannot train good ones, it is necessary to halt the training of poor specialists. A "half knowledgeable person" is much more dangerous that a person who has not knowledge at all in a given matter, for he assumes the settlement of questions and settles them incorrectly.

Now tasks of enormous importance face the higher school. But they cannot be accomplished only by personnel of the higher school. These are truly national tasks. A special role in their accomplishment belongs to the Academy of Sciences. This is not only our first teacher, this is our reserve of instructors. The academician was always a professor, students always followed him. A prominent scientist practically always had students.

But a student is also still far from everything. There are usually a handful of textbooks. Textbooks are more significant, but our textbooks in most cases are poor. A textbook differs from a monograph by the fact that a development part—problems, exercises—which, moreover, has been written by the same author and no one

else, holds an important place in it. But the present textbook, as a rule, is intended for paraphrasing and exposition and does not have a development part.

Unfortunately, this has become a distinctive trait of our pedagogical system and has had the result that the examination has become only a "discovery" examination: they do not ask what the student knows and what he has a command of, but what he has heard and remembers on a given question. Oral examinations have become a part of the system and have become the main means of testing.

Only specific questions of pedagogy of the higher school have been touched upon here, but their settlement will make it possible to restructure the entire system and thereby to attain a higher quality of training of specialists. The higher school expects assistance in this matter from the Academy of Sciences.

Corresponding Member of the USSR Academy of Sciences R.G. Butenko

In my statement I would like to speak about the problems, difficulties, and prospects of a comparatively new direction in biology—cell biology.

Academicians G.I. Marchuk and Yu.A. Ovchinnikov have already spoken about several practical technologies that exist on the basis of cell biology. The term "biology of the cell" is most often used in studies of the cells of multicellular organisms of animals and plants, here the entire, integrated behavior of the cell is studied, although the molecular, genetic, and physiological aspects are also very important. The principles of cooperation and the development of a tissue resemblance are characteristic of the cells of animals and plants, even when they are grown outside the organism in artificial culture media, and this should also be studied as a biological peculiarities of these cells.

Our knowledge with respect to the molecular principles of cell biology for the present is still limited. But even the knowledge that we have is making it possible today to develop a number of cellular technologies that are very important for the national economy and medicine. Various cellular technologies exist and are being developed in our country. Of them one should first mention the obtaining of monoclonal antibodies on the basis of hybrid animal cells. It is difficult to overestimate the significance of this direction. Monoclonal antibodies have extensive application in medicine especially for diagnosis. In addition, it is possible to use monoclonal antibodies, owning to their specific nature, as a probe, which makes it possible to study precisely and in depth the basic processes in biology.

Another technological direction is the commercial growing of plant cells for obtaining a large number of substances that plants themselves synthesize. For the most part these are drugs which are used in medicine. However, the possibilities of this direction in biotechnology are significantly broader, because plant cells are variable, and from them it is possible to obtain many new biologically active compounds that differ from those that exist in plants. The plant cell has the unique ability to reproduce from a cell buds and germs of a plant, and then the entire plant. This property is the basis for rapid clonal micropropagation. By traditional methods it is usually possible to obtain in case of the propagation of a plant 50-100 new specimens a year, while in case of clonal micropropagation it is possible to obtain from 500,000 to 1 million new plants during same period.

Genetic manipulations of the cell, the use of its mutability, and the introduction of genes and chromosomes are making it possible to create the necessary prerequisites for obtaining new breeding forms of plants.

The work in this direction is being performed by us in cooperation with enterprises of the Ministry of the Medical and Microbiological Industry, at which cell cultures are being used on a commercial scale, as well as with institutions of the State Agroindustrial Committee, which are actively and willingly assimilating cellular technologies. However, the leading development of auxiliary industry—the development of the necessary equipment for work under sterile conditions, the appropriate glassware, and so on—is absolutely necessary for the profitability of these new works. But a lag in this sphere, which may hinder the overall trend of this work, is being observed in our country.

I also want to stress the vital importance of basic research in the study of cell biology. It is necessary to develop and intensify it. Cell biology as a new direction of science originated at the Institute of Plant Physiology imeni K.A. Timiryazev of the USSR Academy of Sciences. Academician A.L. Kursanov is the initiator of this direction. There is not enough space for the further development of research work on cell biology within the walls of the institute—it is necessary to speed up the construction of the laboratory building. Only in this case can the development of this new promising direction in biology be successful.

Academician I.A. Glebov, Chairman of the Presidium of the Leningrad Scientific Center of the USSR Academy of Sciences

The acceleration of scientific and technical progress requires the most complete use of the means we have for the solution of important national economic problems.

A large reserve lies in the enlistment in the development of basic and fundamental research of institutes that are under the scientific methods supervision of the USSR Academy of Sciences. In Leningrad there are four such organizations: the All-Union Scientific Research Institute of Electrical Machine Building, the VNIIM imeni D.I. Mendeleyeva Scientific Production Association, the

All-Union Scientific Research Institute of the Mechanical Processing of Minerals, and Leningrad Polytechnical Institute. Recently the Tsentralnyy kotloturbinnyy institut imeni I.I. Polzunova Scientific Production Association also joined them.

The joint consideration by the management of the Leningrad Scientific Center and these organizations of the long-range plans of their scientific research work for the 12th Five-Year Plan showed that along with academic institutes they are conducting a significant amount of basic research. The All-Union Scientific Research Institute of the Mechanical Processing of Minerals increased by fourfold the amount of basic work during the 12th Five-Year Plan as compared with the past five-year plan. Such joint consideration of the plans made it possible to specify and adjust the themes of a number of basic and fundamental studies at the Leningrad Scientific Center.

Among the most important directions it is possible to note the research on the increase of the reliability of parts and assemblies of generators and mining machinery and on the problems of the vibration isolation of mechanical objects, the development of new methods of the mechanical destruction of solid materials and of unlubricated friction assemblies of machines based on new mineral-polymer composites, the development of high precision methods and means of measurements of large forces, vibrations, parameters of motion, and so on.

We supported the initiative of the All-Union Scientific Research Institute of the Mechanical Processing of Minerals on the organization of a joint collective-use center based on the exhibits of the Technological Mineralogy-87 International Specialized Exhibition in Leningrad. By using this equipment, it is possible to establish an experimental center for all the organizations, which are participating in the work of the Mekhanobr Interbranch Scientific Technical Complex, as well as the institutes of the Leningrad Scientific Center and higher educational institutions of the city. A decision on the establishment of the Collective-Use Center was adopted by the State Committee for Science and Technology at the beginning of this year, and we hope that the close cooperation of the All-Union Scientific Research Institute of the Mechanical Processing of Minerals and the Leningrad Scientific Center will make it possible to meet to a significant degree the needs of academic institutes for high resolution spectral and X-ray instruments, electron microscopes, chemical analyzers, and other devices.

The second reserve is the speeding up of operations of the interdepartmental level. Among them first of all are the optimization of the production and the complete use of wood in the Northwest Region of the country. In volume logging holds the place that follows the production of coal, petroleum, and gas. The consumption of wood in the country is increasing all the time, the range of materials and items made from it is broadening. Meanwhile the technological processes of the complete processing of timber raw materials are inadequately backed by basic research on all the biomass of wood.

For the purposes of pooling the efforts of isolated scientific collectives for the solution of this problem and of eliminating the focus on petty topics and parallelism in their work the Presidium of the USSR Academy of Sciences commissioned the Interdepartmental Coordinating Council of the USSR Academy of Sciences in Leningrad to formulate a goal program of basic scientific research that ensures the accomplishment of the basic tasks of the complete use of wood, as well as the conducting of basic and applied scientific research in the area of the physics, chemistry, and mechanics of all the biomass of wood for the purpose of developing highly productive promising technological processes of its processing.

The Scientific Council for the Problem of the Complete Use and Reproduction of Timber Resources with the participation of the Scientific Council for the Problem "The Chemistry of Wood and Its Basic Components" of the USSR Academy of Sciences formulated a comprehensive goal program of scientific research for 1986-1995—"The Complete Use of Wood and the Optimization of Its Reproduction."

The improvement of the existing methods and the development of new methods of obtaining paper pulp and cellulose fiber materials, which are intended for the production of paper, cardboard, fiberboards, synthetic fibers, and plastics, are envisaged within the basic section of this program, "The Scientific Bases of the Processing and Use of Wood." Their production should be based on the complete efficient use of all the biomass of wood and other plant materials, which are noted for a heterogeneity of properties, while this requires a thorough knowledge of the peculiarities of the fine structure, chemical composition, anatomy, and morphology of the plants being used at all levels of their formation.

The Council for the Problem of the Complete Use and Reproduction of Timber Resources is enlisting in its work the scientific forces of Leningrad, where 80 percent of the specialists of the highest skill of the country in the field (more than 4,000 scientific associates, including 125 doctors and more than 1,000 candidates of sciences, and about 2,000 engineering and technical personnel) are concentrated. The Leningrad Technological Institute of the Pulp and Paper Industry is the base organization of the council.

The reorganization of the work requires the development of the material and technical base of the organizations of the Leningrad Scientific Center by means of capital construction. During the years of the 11th Five-Year Plan construction and installation work amounting to 30 million rubles was assimilated at facilities of the center, moreover, the Leningrad Construction and Installation Administration of the Central Construction

Administration of the USSR Academy of Sciences [Lenakademstroy] accounts for about 40 percent of the work. The remainder was carried out by Glavspetsstroy and the Main Administration for Construction in Western Regions. In 1982 the amount of work, which was performed by the construction and installation administration of Lenakademstroy on capital construction, came to only 1.9 million rubles. Such a situation, of course, aroused great anxiety, especially in connection with the construction of the academic campus in Shuvalov.

For its correction steps were taken on the building of houses and dormitories for construction workers, the renovation of the construction component plant, and the annual training at vocational and technical schools of 100 workers of construction specialties, the limit registration of workers was permitted, and the changeover to prefabricated components of its own making was carried out in construction. These measures were supported by the Leningrad Oblast Committee of the CPSU and the management of the USSR Academy of Sciences.

During the 12th Five-Year Plan the amount of capital construction should be increased by more than twofold. Here the amount of construction and installation work by our own forces should come to 30 million rubles.

Government decrees on the construction of the Nauka Printing Plant, the Nauka Publishing House, premises for the Central Office for the Dissemination of Literature Published by the Nauka Publishing House, laboratories of the Botany Institute, and the Pilot Industrial Base of the Institute of Silicate Chemistry and the Institute of High Molecular Compounds are needed during the 12th Five-Year Plan for the drafting of planning estimates.

Subsequently we will strive to increase the interaction of our academic institutes with other organizations and to use the results of research in various sectors of the national economy.

Academician V.V. Struminskiy

In the substantive report of President of the USSR Academy of Sciences Academician G.I. Marchuk the enormous amount of work of scientists of the academy was summarized and the general directions in the development of science for the next five-year plans were outlined. The report of the president was supplemented for the first time by reports of the chairmen of the sections of the Presidium of the USSR Academy of Sciences—Academicians Ye.P. Velikhov, Yu.A. Ovchinnikov, A.L. Yanshin, and P.N. Fedoseyev. At the General Assembly the detailed report of Vice President of the USSR Academy of Sciences Academician V.A. Kotelnikov was delivered and valid criticism of the development of the social sciences in general and the elaboration of a number of philosophical and economic problems, which are most closely connected with the pace of the building of socialism, in particular was given.

Proceeding to the basic part of the statement, first of all I will note that the problems of restructuring and the acceleration of scientific and technical progress, which were raised by the April (1985) CPSU Central Committee Plenum and the 27th party congress, are being developed more slowly than was anticipated earlier. Why is it happening this way?

For the radical acceleration of scientific and technical progress and restructuring it is necessary to solve a number of basic problems in the area of the natural and social sciences, first of all such problems as the conformity of the economic structure of society (the real base) to the socialist superstructure and the forms of the applicability of the law of value. The Academy of Sciences should study these problems and prepare them for consideration by directive organs.

The Academy of Sciences should conduct research with allowance made for the experience of the building of socialism in our country and in other socialist countries and make a choice of the two alternate possibilities: to retain the existing economic structure of society and concentrate all efforts on the transformation of the superstructures that tower above it and on the reform of the social consciousness of the people; to reform the economic structure of society, extensively using leasing, cost accounting, the collective contract, and personal and, perhaps, private property on a limited scale. Here one should base oneself on the law of value with allowance made for the limitations of its effect under socialism, which follow from the theoretical principles that were formulated by M.S. Gorbachev at the October (1985) CPSU Central Committee Plenum: "The development of socialism into communism is governed by objective laws of society. Any attempts at anticipation, at the introduction of communist principles without regard for the level of the material and spiritual maturity of society, as experience shows, are doomed to fail. But slowness in the making of urgent changes and in the accomplishment of new tasks is also intolerable."

The Academy of Sciences has already performed much work on the restructuring of the activity of scientific organizations and has raised in this connection a number of new important questions. At the same time the basic problems of the natural science and social science type, which were discussed above, so far have not been solved.

In light of the decisions of the April (1985) CPSU Central Committee Plenum and the 27th party congress priority attention should be devoted to these problems. The most talented and creatively active natural and social scientists should be involved in their elaboration, in order to radically speed up restructuring and the acceleration of scientific and technical progress in all spheres of activity of our country. To expedite the solution of these most important problems it is necessary in the central press to conduct a broad discussion of them, to organize a debate, and to attract the attention of the entire scientific community.

I will now dwell on the questions which have been raised in recent times by the Presidium of the USSR Academy of Sciences.

The question of granting greater powers to the departments of the Academy of Sciences has become quite urgent, here one should bear in mind not only scientific organizational, but also staff and financial powers (of course, provided that the management staff does not increase greatly).

In recent times the importance of the section of the Presidium of the USSR Academy of Sciences in the scientific respect has weakened significantly. Moreover, the sections at times hinder the development of promising work of the department. I believe that the sections of the Presidium of the USSR Academy of Sciences can still retain their role as a coordinator of science for a number of intersectorial problems. The Problems of Machine Building, Mechanics, and Control Processes Department of the USSR Academy of Sciences is most closely connected with other departments with respect to the most important problems of technology and power engineering. Apparently, it is advisable to establish a new section of scientific and technical problems of mechanics, technology, machine building, and power engineering, first of all for the coordination of scientific research in these directions.

The question of the age qualification of the scientist is very complex, and one should not treat it formally. Many scientists of advanced age also not only successfully elaborate scientific problems, but also manage large scientific centers. Everyone knows the names of Academicians I.P. Pavlov, A.P. Aleksandrov, N.N. Bogolyubov, and others.

It is high time to evaluate a scientist not according to his eloquence, not according to his age, but only according to his scientific output. I fully support the proposal of the Presidium of the USSR Academy of Sciences on the introduction of an age qualification of management personnel of science. Such restrictions were already introduced long ago in the United States, England, and the FRG, moreover, a maximum age of even 60 is being set for managers of science.

Western countries are gaining greatly from this, since the continuous elimination of poor scientists and poor organizations from problems of scientific and technical progress is occurring. At the same time creatively active scientists and good organizers of science are being hired by numerous firms and corporations for the solution of the most important problems of scientific and technical progress.

If in our country upon the achievement of a specific age the activity of a scientist is critically analyzed and scientists, who have a large scientific reserve, are granted the opportunity to continue active work on its elaboration, our country will also gain substantially from the introduction of an age qualification.

During the period of restructuring the solution of the most difficult problems rests on the shoulders of the Academy of Sciences, and I am confident that scientists will successfully cope with these problems and will ensure acceleration and restructuring in all spheres of activity of our enormous state.

Academician L.N. Koshkin

The Presidium of the USSR Academy of Sciences expressed the wish that academicians and corresponding members would prepare their views on the prospects of development of the Academy of Sciences. In this level I also want to express my opinion.

It is probably quite indisputable that the Academy of Sciences should be developed in conformity with the tasks that are arising in the national economy and in the life of society. One must correctly evaluate the importance of the areas of the national economy and not lose sight of their tasks.

Production and, specifically, its main components—technologies and production machinery—are one of the most important areas of human activity. The importance of this area is governed by the fact that about 70 percent of the able-bodied population is employed in it, while it provides the entire population with what is needed. That is what its significance is. A technical revolution is also occurring in this sector. Meanwhile at the Academy of Sciences the production area of human activity is very poorly represented: to approximately the same extent as, for example, archeology, and to a much smaller extent than linguistics (although this does not at all mean that archeology is uninteresting or is not of importance).

The essence of the scientific and technical revolution, which is occurring in the area of technology and production machinery, consists in the fact that a changeover from machines, which machine an object when stopped near the tool, to machines, which carry out machining in the process of the joint conveying of objects and tools, is being carried out. It would seem that the distinction is not striking, but it is leading to a change of the very essence of production machinery and in the end to a ten- to hundredfold increase of the most important economic indicator, namely the social productivity of labor. The accomplishment of the basic tasks of the present socialist system: the provision of everything necessary (of course, within the limits of the availability of source materials), the shortening of the time of employment to 2-3 days a week, and others, involves just such a change of the level of labor productivity. Another important feature of the present social formation—socialism or its highest

forms—is the elimination of so-called nonprestigious occupations and, frankly speaking, occupations that do not conform to man's possibilities, his physical data, requirements, and needs.

Inasmuch as radical restructuring in the area of technology and production machinery is urgent and is being carried out, it is obvious that the Academy of Sciences also cannot remain aloof of this immense job. Especially as the opponents of the scientific and technical revolution are offering staunch resistance. Now, especially following the decisions of the Politburo of the CPSU Central Committee on the acceleration of scientific and technical progress, the direct attacks of the opponents of acceleration, including the opponents of the launching of work on the development of machines of a new class, of course, have become impossible. The resistance has gone over to a positional defense, diverting a significant scientific and technical potential for the development of obsolete machines and technologies. I will cite several figures which show that such a distribution of resources, productive forces, and scientific and technical potential must not be tolerated.

About 3,000 people are engaged in the production of advanced rotary conveyor machines, 500,000 people are engaged in the improvement of old machines which do not make it possible to increase labor productivity significantly. Hundreds of plants produce old machines, only experimental shops produce new ones. It is necessary during one five-year plan to prepare technical solutions and during the next five-year plan to begin the extensive retooling of production and the transformation of the new class of machinery into the dominant form of equipment.

To evaluate correctly the importance of new equipment and to provide the necessary conditions for it, to surmount resistance and the lack of understanding—all this is the job of the Academy of Sciences. Moreover, it is especially important to elaborate criteria for the evaluation of new directions and new solutions. If those who work by following an incorrect criterion do not understand what should be achieved, enormous forces and assets will be spent in vain.

I will cite an example. Production and other machinery is evaluated nearly always by the mean time between failures. But it is possible to obtain an enormous mean time between failures in hours, if the output is reduced or the machine is halted altogether. Another indicator of agricultural machinery is the capacity of the threshing mechanism, which is defined as the number of kilograms of threshed grain a second per combine. This is an indicator not of the machine and not of the combine, it depends on the crop. How is it possible to use it for improving the design of the machine? And still they evaluate precisely according to it what kind of new machine is being developed.

And, finally, there are a large number of technological problems, especially in the sphere of light industry, the solution of which will lead to the release of tens of millions of people. These problems are extremely labor-consuming ones, which, perhaps, require tens of years for their solution. It is necessary to attract to them the attention of representatives of the basic sciences, moreover, the most diverse sciences, which are even very remote from technical directions.

I hope that now under the new director of the Academy of Sciences, who has vast organizational experience, the significant potential of academic science will be enlisted in the solution of production problems, which will decisively speed up our progress.

Academician A.A. Samarskiy

The Academy of Sciences—and this was noted in the statements of the president, vice presidents, and all preceding speakers—is faced with tasks of unprecedented difficulty: the assurance of the steady development of scientific and technology, the fulfillment of the social orders of society, the search for new means and approaches to the most urgent scientific directions, and the acceleration of scientific and technical progress.

The methodological modernization of scientific and technical research and science itself on the basis of its thorough mathematization and the extensive use of the methods and results of mathematical simulation and the computer experiment is necessary for the accomplishment of these tasks.

The restructuring of science and the acceleration of scientific and technical progress are not only new machines and materials, but also a revolution in methodology, without which it is impossible to count on fundamentally new solutions of key problems and qualitative changes. Methodological modernization is possible only on the basis of the mathematization of the scientific and technical revolution, for accurate and thorough forecasts and specific quantitative characteristics, which are obtained relatively quickly and inexpensively, are needed.

Such a methodology—mathematical simulation—was developed by our mathematics. Experience in its use when solving the most important complex problems already exists (but I do not have the opportunity to dwell on this). The decree of the party and government of 13 November 1986 is aimed at a statewide scope of the work in the area of the development of the mathematical sciences, particularly mathematical simulation and the computer experiment. A unified statewide program of work on mathematical simulation should be developed, which, incidentally, is very important for the accomplishment of present tasks with a large economic impact. It will actually be possible to speak of the establishment of a mathematical simulation service.

The implementation of the decree is an urgent problem of the day, here quick actions are needed, since it is more difficult to introduce a new technology than a new instrument or material. Unprecedented problems, and first of all the insufficient psychological and professional preparation of management for the acceptance of the new methodology, are arising in this direction. The matter is being aggravated by the insufficient number and organizational isolation of the people working in this area.

In this respect the situation with computer hardware and the means of information science, which are based on it, is indicative. Complaints about the shortage of computer hardware can be heard from everywhere. Meanwhile it is often used inadequately. On the one hand, there are a limited number of institutes, which are developing methods and means of computer technology and applied mathematics, while, on the other, there are thousands of computer centers and automated control systems, where computer hardware is being used extremely inefficiently. Unfortunately, a purely technical approach is widespread: if there were some more computers and some more programmers, perhaps something would come of it. Here all the old management and information structures are being retained. There is not enough in-depth research on the processes, which they intend to control and which they want to optimize. Fundamentally new solutions cannot be obtained in such a direction, a new approach is needed.

The harmonious development of the triad—computer science, computational mathematics, and programming—is necessary. The situation is being complicated by the fact that in recent years the West has been actively changing over to the mass use of computer hardware and technology and to the use of supercomputers not only for computer graphics, but also for the complete analysis of designs and so on.

Our priority task is to convince the public and management as quickly as possible of the inevitability of mathematical calculations for the improvement of technological processes. For example, the imposing plans on machine building cannot be fulfilled by means of the former methodology. Let us emphasize that all the diversity of problems of machine building reduces to a small set of tasks that lend themselves to study. But in addition to the machine building sector there are a large number of sectors, in which the use of computer hardware and mathematical calculations is absolutely necessary. But apart from the realization of this task an initial contribution to the development of the technological base, to the devising of models, and to the implementation of specific industrial objects—a kind of credit or advance—is required of the sectors. The "venture capital" is very negligible, if it is invested now, and not in a few years, for it is well known that "a miser pays twice."

A system, which realizes our principle of payment according to labor, is needed, moreover, the methods of its updating should be most directly connected with the reorganization of the higher school and the training of personnel. It is now already necessary to incorporate in it demands on the specialist, on whose shoulders the development and use of new methodologies rest. These demands, in general, are clear: a knowledge of the fundamental principles of the chosen specialty and the methods of constructing mathematical models and computer algorithms and the ability to interact with computers.

Centers of mathematical simulation are also needed at higher educational institutions. This is an inexpensive means of combining the educational and scientific process, for which the higher school is so striving. An interest of sectors in the quality of the training of specialists, feedback with them, the payment of the expenses of the higher school by sectors, and the monitoring of the quality of the training of specialists at higher educational institutions are of the greatest importance.

The tasks of the methodological modernization of science and production and of the mathematization of scientific and technical progress should be accomplished at a pace which leads the development of the material bases of restructuring. Mathematical simulation and the computer experiment are the most economical technology, while several stages of it are practically free.

The use of mathematical simulation is an effective means of speeding up basic research of any type—theoretical and experimental. The theoretical problems, for example, in astrophysics are now essentially nonlinear and, hence, traditional methods are often ineffective. Experiments need processing and automation. Without mathematical simulation it is impossible to solve such problems as the development of computer-aided design systems, automated control systems, flexible machine systems, and so on.

In his report Academician V.A. Kotelnikov spoke of the fact that instrument making is relying on the latest achievements of physics. I would like to add that it should rely on the latest achievements of information science and computational mathematics, since the changeover from a measuring instrument to a computer measuring complex in a number of cases makes it possible to get rid of the restrictions that were dictated by the very nature of the phenomenon, that is, to go beyond the limits which can be achieved by any instruments that is as advanced as you like. This, it seems to me, is a fundamental fact. It is necessary to support and develop the work in this direction both at the Academy of Sciences and in the sectors.

I want to stress that mathematical simulation is of a general-purpose nature. It is necessary to understand this, it is necessary to take this into account, it is necessary to use this. It can be said that the personnel, who have mastered mathematical simulation, computational mathematics, and computer hardware, are now

deciding everything. The radical restructuring and methodological modernization of all science on the basis of mathematical simulation are urgent. Such a concept clarifies many problems of the forecasting and development of science. All the institutes of the Academy of Sciences, first of all those in the field of physics, chemistry, biology, mechanics, mathematics, and information science, should take an active part in this work. Fundamentally new important results can be obtained already now with the minimum expenditures of resources.

Academician V.S. Pugachev

Mathematics is one of the important, priority directions of the development of science. In conformity with the decree of the government of 13 November 1986 the work in the field of mathematics should be stepped up in every possible way. In what direction and how must this task be accomplished?

First of all I would like to note that an enormous arsenal of powerful mathematical methods, which it is possible to use for the solution of the most diverse problems, has been developed over the centuries-long history of the existence of mathematics. But the methods of mathematics often prove to be complex, and until recently its use was greatly limited by the difficulties of the calculations, to which they led. Suffice it to say that many calculations in the field of physics and astronomy previously were made over the course of tens of years.

The appearance of high-speed computers increased drastically the possibilities of the use of mathematics and broadened the range of problems which it is possible to solve by means of it. Owing to this mathematics is beginning to quickly penetrate and, perhaps, has already penetrated all spheres of human activity and all fields of science. Therefore, the decree of the government on the extensive introduction of mathematical methods in all sectors of the national economy is very timely and will help to accelerate scientific and technical progress substantially.

As a consequence of the rapid development of computer technology in recent decades the modern computer can accomplish in fractions of a second the problems and calculations, which were previously solved and made over the course of tens of years. It is necessary, of course, to use such an expansion of the possibilities. It is necessary to perform the work in the area of mathematics first of all in the direction of the development of applied methods of research, which are suited for the solution of problems by means of modern computer hardware. This should be done at the same time as the intensive development of computer hardware of mass application, first of all personal computers. Only computer hardware of mass application will make it possible to accomplish the tasks posed by the party and government with respect to the dissemination of mathematical methods. Here one must not forget that in itself computer hardware, as the bitter experience of our recent past teaches, will not solve the problem. It is not enough to have mathematical methods and mathematical machines, it is necessary to develop the corresponding software for these machines. Moreover, the extensive introduction of mathematical methods and computers in all spheres of activity is possible only in case of the development of such smart software so that the user could feed into a personal computer the necessary source data and set for the computer a task—what it should obtain and in what form as a result of calculations, and after the making of the calculations and the obtaining of an answer could ask the computer the necessary questions, obtain answers, and make the corresponding forecasts—such interaction with the computer will be truly effective.

Taking into account that it is necessary to apply mathematics to the broadest group of specialists in various fields, it is necessary to orient software so that computers could be used by specialists in various subject areas, who do not have special training either in computer technology or in the area of those mathematical methods, which will be incorporated in the corresponding programs for these computers. Only then will the extensive dissemination of computer hardware and mathematical methods in all sectors of the national economy become possible.

I want to note that I am not an advocate of the division of mathematics into pure and applied mathematics. I believe that mathematics is unified and that the most abstract fields of mathematics are necessary for the substantiation of the mathematical methods which are used in practice. For example, the modern methods of studying stochastic systems for their complete substantiation need the development of the theory of differential equations in abstract spaces. If this theory does not exist, the strict theoretical substantiation of the methods being used will also not exist.

Mathematical models are necessary for the use of mathematical methods, about which Academician A.A. Samarskiy has already spoken here. In the world surrounding us there is no mathematics, and for the study of phenomena by mathematical methods it is necessary to use mathematical models. All the laws of physics and other fields of science, which use mathematics, are nothing other than mathematical models. But for the introduction of the methods of mathematics in all sectors of the national economy it is insufficient to know how to construct mathematical models of such systems and phenomena, for which physics provides already ready-made laws. It is necessary to know how to develop mathematical models of various production processes in industry and agriculture and mathematical models of various systems—ecological, biological, and others—with which one has to deal in practice.

Therefore, one of the most important directions of development of mathematical science is the devising of methods of constructing mathematical models of the

most diverse systems in accordance with experimental and statistical data. Here it is important to provide the methods of constructing mathematical models with smart software, which would enable specialists in various subject areas to construct with the aid of computers any mathematical models of any processes without special training. Among such mathematical models stochastic systems, that is, systems that take into account various random factors, will play a large role. We know that many phenomena in the world surrounding us occur under the conditions of the effect of such factors. Probability theory, which is one of the most important directions of mathematics, about which Academician G.I. Marchuk spoke in his opening speech, is the most suitable body of mathematics for describing random processes.

It is necessary to know how to construct stochastic models. At the Institute of Problems of Information Science of the USSR Academy of Sciences work is being performed on the devising of new methods of studying stochastic systems and the software for them, which people, who do not have specialized mathematical knowledge and training in the field of computer technology, will be able to use.

A characteristic feature of these methods is the large scale of the problems. One has to deal with systems that are described by a large number of equations. Suffice it to say that the problems of processing the results of tests of airplanes and other aircraft reduce to systems which consist of approximately 150 equations. For example, the mathematical model of the ecological system of the Sea of Azov, which was developed by the Northern Caucasus Scientific Center, is described by a set of nearly 1,000 equations, while more than 1,500 equations are included in such a complex system as the mathematical model of the U.S. national economy. It is necessary to develop such methods that do not depend on the number of equations, only then will it be possible to encompass the entire range of phenomena that are being studied by means of mathematical methods. But this leads to the great complexity of computing processes, which, in turn, makes new demands on computer hardware, and first of all its speed.

In addition to the work on the development of software of the methods of studying stochastic systems at the Institute of Problems of Information Science basic research on the development of computer systems of new generations, particularly on the computer-aided design of large and very large integrated systems, and work on the comprehensive development of algorithms and architectures of computers and the technology of their programs are being performed. All these operations are being performed so that it would be possible to unite personal computers of the immediate future into systems and networks of interacting computers.

Finally, in conclusion two words on the training of personnel. I believe that the training of personnel is one of the most important duties of the scientist. As the history of the development of higher education shows, only a prominent scientist can develop new educational disciplines on the basis of the latest achievements of science. Therefore, I propose to note in the Charter of the Academy of Sciences that the training of scientists is one of the most important duties of members of the academy, and in conformity with this to insert in the Statute on Advisers a paragraph, in conformity with which they have the right to engage through joint appointment in pedagogical work at higher educational institutions.

President of the Armenian SSR Academy of Sciences Academician V.A. Ambartsumyan

At this General Assembly the discussion of the basic results of the development of science has been organized in a new way and is making it possible to form a clear idea of what is being done in our country. The discussion was especially edifying for us, who work at the academies of sciences of the union republics, inasmuch as at times we are inadequately informed about the process of scientific development of the country as a whole.

The academies of sciences of the union republics were repeatedly mentioned in the reports. From them it became obvious that the overall level of development of science in the republics is still insufficiently high. This is especially conspicuous, if you consider that in aggregate in the number of scientists and, consequently, in the spent wage fund the academies of sciences of the union republics are not inferior (or are a little inferior) to the USSR Academy of Sciences.

President of the USSR Academy of Sciences Academician G.I. Marchuk in his statements repeatedly stressed that in our country there should not be either a separate first-class or second-class science, all science should be at the highest possible level. This principle makes it possible to formulate the proper approach to and the proper demands on the development of science in the union republics. Each republic academy in every scientific direction should have its own character. The aspiration to follow what is being done, for example, in the capital or abroad leads to the loss of originality.

At the republic academies their own directions should be developed and new ideas should appear, otherwise stagnation occurs: with time scientific institutions begin to repeat themselves, and at times, what is worse, repeat others.

At the Armenian SSR Academy of Sciences we always strove in the every field of science to have our own character. We are proceeding from the fact that the republic academy should not be a small model of the USSR Academy of Sciences, it should differ qualitatively from the USSR Academy of Sciences. I will attempt to explain the uniqueness of the Armenian SSR Academy of Sciences on the basis of the example of astrophysical research.

One of the most important aspects of modern astrophysics is the evolutionary approach. Whereas in the 19th century they attempted to settle the question of the development of celestial bodies by means of far-fetched cosmogonic hypotheses, in the first half of the 20th century, when an enormous amount of data on celestial bodies was gathered, evolutionary ideas began to emerge out of the necessity to generalize these data. Objects of the universe, which are in a nonstationary state, began to be studied with particular attention. The study of nonstationary star clusters marked the beginning of the work of Armenian astronomers in the field of evolutionary astrophysics. Very many nonstationary objects were discovered in the world of galaxies. The origin here of the ideas of the activity of galactic nuclei opened the way for the extensive development of evolutionary astrophysics at the Armenian SSR Academy of Sciences. Fortunately, a telescope, which is extremely effective for the study of galaxies, had been installed at the Byurakan Astrophysics Observatory of the Armenian SSR Academy of Sciences. Now the ideas of the activity of the nuclei of galaxies have become widespread in the world, many galaxies with active nuclei have also begun to be discovered by foreign astronomers.

At present the questions of the nuclei of galaxies, including studies of the nature of quasars, have become the basic subject of study in the field of extragalactic astronomy. A large number of new quasars, in one of which the discharge of matter is occurring at a speed of more than 10,000 kilometers a second, have been discovered at the Byurakan Observatory.

The Armenian SSR Academy of Sciences is also striving to have its own character in other sections of science. Armenian mathematicians have made great gains in the settlement of questions of the theory of complex variable functions and the theory of approximations. In addition to classical fields new mathematical directions, for example, integral geometry, and particularly combinatory integral calculus, have emerged at the Armenian SSR Academy of Sciences.

I have cited examples from astronomy and mathematics, since I myself work in these scientific directions, but I could have also cited examples from other fields. We are striving to achieve the world level in all fields of science, but, of course, do not always succeed in this.

Last year the restructuring of the wage system at scientific institutions of the Armenian SSR Academy of Sciences was for the most part completed, which made it possible to reveal enormous possibilities for the improvement of scientific work. For example, at the Byurakan Observation the number of permanent departments was reduced drastically and temporary creative groups, which have a specific direction of research, were established. The observatory cannot completely reject permanent departments, because departments for the service and development of large telescopes or a special department for the automation of the methods of processing observations are needed. The system of temporary creative groups has not yet received proper development at other institutions of the Armenian SSR Academy of Sciences, but it is necessary to use it more extensively.

The Armenian SSR Academy of Sciences is also lagging greatly in the introduction of the results of scientific development in practice. The new demands, which the party and government are making, are forcing us to think more about the use of research result in practice.

And the last thing that I would like to speak about is doctoral studies. Does the academy need doctoral studies in their present state? This seems at least doubtful to me.

Vice President of the Ukrainian SSR Academy of Sciences Academician I.I. Lukinov

The strategy of intensive economic development envisages the substantial increase of production efficiency. During the preceding three 5-year periods the trend was the opposite. Given the overall decrease of the pace of economic growth the degree of the cost accounting recovery of the capital of industry decreased by nearly twofold. The output-resource ratio in agriculture, construction, and other sectors declined. Distortions began to appear in the social law and spiritual spheres.

I would err from the truth, if I said that economists, lawyers, sociologists, and other social scientists "did not notice" these phenomena. On the contrary, the negative trends were analyzed, their causes were identified, and steps on overcoming them were proposed. But, unfortunately, these steps were not implemented. In essence, no one reacted in earnest to the increasing effect of the economic mechanisms, which give rise to and stimulate the increase of production costs, and to the intolerable slowness of technological, structural, and qualitative updating. And thus far they are still far from being overcome, although the first steps of restructuring have already yielded major changes.

However, one must not shut one's eyes to the fact that even in a number of very dynamic sectors of industry the annual rate of replacement of worn out machines and equipment does not exceed 2-4 percent; they are being replaced primarily by analogs, which were developed for previous, extensive technologies, which do not provide an appreciable increase of labor productivity, a saving of resources, and ultimate efficiency. This gave rise even to the mistaken views that scientific and technical progress inevitably increases the cost of production. Meanwhile the study of world and the best domestic experience testifies with all obviousness: modern expensive science-intensive production systems ensure an increase of the

impact by means of the increase of the scale of production and quality, a low labor-output ratio and production cost of items, and the flexibility of the adaptation of the assortment to changing demands of the market.

Now by no means individual models of even the best equipment and instruments, but integrated technological systems, which revolutionize the entire production cycle, are solving the problem of efficiency. One should not entertain any illusions with respect to the rapid impact from specific technological improvements. The situation is also exactly the same in case of the attempt to change enterprises over to cost accounting principles: partial changes of some units or others of the system of economic management. These steps will not yield the anticipated impact. More radical reform is needed. Full cost accounting not only unleashes the initiative and interest of labor collectives and activates all the socioeconomic life of society, but at the same time strengthens the effect of the factor of risk and uncertainty, which require flexible planned regulation. The scientific conception of the new economic mechanism—a catalyst of economic interests—involves cardinal changes in the system of production and distribution relations, planned management, and structural, investment, price, financial, and credit policy.

It would be incorrect to expect that the changeover of enterprises and associations, sectors and the entire national economy to the conditions of self-financing and self-support [samookupayemost] will be easy and painless, as is frequently presented now by the mass media. The first steps of the work on the new principles have already revealed considerable difficulties and contradictions in the prevailing system of regulation. And this is still by no means full cost accounting in its classical understanding. For some works and groups of enterprises are unprofitable and require subsidies. Moreover, a significant portion of the enterprises have a low profitability, which does not make it possible along with budget payments to create cost accounting funds for self-financing.

The coal industry, which is living primarily on budget subsidies, is operating at a loss, many enterprises of municipal and personal services and agriculture and construction organizations are unprofitable and have a low profit. They cover the losses and investment capital by means of revenues that have been taken from efficiently working collectives. I am no longer speaking of the enormous state subsidies to trade in meat and several other food products. Consumers are essentially subsidized by means of this. The processes of the increase of the cost of production and the decrease of the output-resource ratio entail the unjustified increase of prices, while attempts to compensate for the imperfection of prices by budget redistributions only complicate the situation.

Without the changeover of labor collectives to strict cost accounting principles it is impossible to overcome unprofitability and a low profit and to increase the efficiency of production and circulation.

According to our calculations, for the normal operation of labor collectives on cost accounting principles the output-capital ratio should not fall to less than 10 percent, while 14-15 percent might be the standard.

We are conducting basic research on the trends of the formation and movement of costs, the production cost, prices, and the profitability for an entire group of sectors, beginning with the extractive industry and ending with the output of consumer goods. A systems analysis and forecast were made by means of the most advanced methods of simulation.

Since state price policy, in allowing the mobility of wholesale and purchase prices, is aimed at the stabilization of retail prices, an economic paradox is arising, when the created value does not find final reimbursement by consumers and requires larger and larger budget subsidies. And, on the contrary, for a number of other goods the final reimbursements by means of artificially inflated prices exceed their real value.

Miracles do not happen in economic life, its laws are realized through the subjective actions of people, but remain themselves strictly objective. Cost-price imbalances, the substantial differences between the nominal and real value of the monetary unit, and disturbances of the equilibrium of supply and demand are distorting the currency and financial system and the course of the ruble. Budget deficits are forming. Inflationary processes are seriously complicating foreign economic relations, requiring the introduction of special equivalents in contra accounts, which are often not advantageous for us. In order to smooth over in some way the negative consequences of the different profitability, it is necessary to resort to steps of mechanical "equalization" by means of withdrawals of not only the profit, but also amortization from profitable sectors and enterprises with their transfer to ones that are unprofitable and have a low profitability.

Thereby the cost accounting principles of management are reduced to naught. Unwarranted leveling "from above" undermines the interests of the best labor collectives and decreases the stimuli for the further increase of efficiency, since people know that they will confiscate everything that is called "extra." But whoever is subsidized outright for many years has already gotten used to dependence on others and also does not long for the achievement of great efficiency.

This research made it possible to formulate positive conceptions of the restructuring of the economic mechanism, which are being analyzed now in the scientific section of the Commission for the Management of the National Economy. Upon completion of this work it is envisages to present the corresponding scientific conception to directive organs.

In conclusion a few words about the substantive report of V.A. Kotelnikov. I share the opinions voiced in the report, but it seems that it is apparently impossible to manage with the three named priority directions: a large number of very important problems, which it is necessary once again to analyze carefully and, perhaps, include among the priority directions, face modern social science.

When evaluating the activity of scientists, including social science research, it seems to me, one must not allow extremes, as they say, to throw out the baby with the water. Obviously, it is necessary to approach more soberly and thoroughly the criteria of the evaluation of the development of a number of directions of the social sciences, in order not to allow unnecessary distortions.

Academician P.G. Kostyuk, Academician Secretary of the Physiology Department

Today we are discussing exceptionally important decisions, which are called upon to increase the efficiency of basic science and to promote the maximum use of the creative forces and experience of Soviet scientists. Physiologists unanimously support these decisions and are doing everything that is within their capability in order to successfully implement them. However, in my statement I want to dwell not on the problems of modern physiology, but on several general questions of our life.

The introduction of a new system of certification and the economic stimulation of the more efficient work of scientific associates are the first very important measure. In this respect a number of difficulties exist.

The first thing is that at the institutes of the Academy of Sciences, at which they are dealing with the fundamental elaboration of problems given a comparatively small state budget, it is extremely difficult to create a fund of such stimulation. The release from work of associates, who do not correspond to the held position, is a most difficult task, and it is accomplished only when they themselves want to leave. But if they do not, a conflict situation, in which the board of directors of the institute is most vulnerable, arises. The Institute of Physiology imeni I.P. Pavlov found itself in such a situation after certification.

The second thing is that we do not have effective evaluation of the quality of the basic research being conducted. For self-evaluation is the basis, since in essence only the scientific council of the institute, to which the very performers belong, evaluates scientific work.

For comparison it is possible to say that in the United States about 10 percent of the entire budget for science is spent on the evaluation of basic scientific research. Such an evaluation is always external, and it determines whether or not assets will be allocated for the continuation of work. What is to be done in connection with these difficulties, first of all, financial difficulties? It seems to me that for a number of institutes of the biological type a change of several principles of financing would be desirable. Now the institutes are faced with tasks—along with basic questions to deal with the settlement of applied questions for industry, agriculture, medicine, and so on, which yield a measurable economic impact. This is correct, but it would also be correct that the corresponding departments, which need such work, would take part in the financing of this work and the creation of the economic stimulation fund. In the socialist countries, for example, in Hungary, such a principle is being used extensively. However, in our country departmental barriers are hindering this. Meanwhile the budget allocations for biological research are so small that if our Institute of Physiology imeni I.M. Sechenov buys one set of computers, it will in practice be deprived of allocations for scientific research for the entire following year.

With regard to the second thing, now the necessity of changing the evaluation of basic work by the establishment of a system of skilled expert evaluation is quite obvious. We have an expensive unwieldy system of the evaluation of candidate dissertations, which does not exist anywhere in the world except in our country. The Higher Certification Commission, undoubtedly, is necessary, but it serves only to regulate questions of the interrelationship between different categories of scientists from the standpoint of the wage. We do not have a system that would evaluate the very results of science.

The reorganization of the Council for the Coordination of the Scientific Activity of the Academies of Sciences of the Union Republics is now under way. I would like the formed councils for the coordination of the activity of departments to have the right to evaluate scientific research work in an expert manner. This is necessary.

For example, now at many institutes of the physiological type in the union republics the themes of the basic directions of research are being reduced and work is being switched to the solution of problems of the feeding of agricultural animals. This is connected with the fact that locally they cannot solve the problems of fodders and instead of organizing their procurement are waiting for unrealistic assistance from physiologists. These are not problems, with which physiological institutes should deal, but such strong pressure is being exerted on the part of local departments that the institutes themselves cannot withstand it.

An objective expert evaluation is the main demand which the CPSU is setting for science, the economy, and industry. Research results should either conform to the world level of science or surpass it. Here they should also be evaluated in the same manner by world science. We should strive for this.

We are constantly confronted with the tendency, especially on the part of developed capitalist countries, to gloss over the achievements of our science. It is necessary

to oppose this tendency by the active display of the achievements of Soviet science at international scientific associations, congresses, and symposiums. For this it is now necessary to eliminate the completely formal restriction of the number of members of delegations, which are sent to international congresses and symposiums. It is necessary to simplify the procedure of publications of articles in international journals.

The opinions that I have voiced concern general questions of the present period of development of our science, but, in my opinion, they should worry everyone, who values the prestige of Soviet science and its priority at the world level.

Academician V.Ye. Sokolov, Academician Secretary of the General Biology Department

At the General Assembly of the General Biology Department the reports of the institutions of the department, which testify to the successful completion of this year, were examined. Now it is necessary to think about the future and about the work in the basic five directions, which were approved by the Presidium of the USSR Academy of Sciences for our department. They pertain, according to the definition of Academician V.A. Kotelnikov, to living nature and concern the study of living objects at various levels—from the molecular to the superorganism, evolutionary, and ecosystem levels.

First, these are evolutionary processes and the dynamics of forecasting. The theory of evolution is of vital importance for the development of all modern directions of biology. For example, for the genetics of selection a knowledge of the microevolutionary processes, which occur in natural populations of animals and plants, is necessary. The study of evolutionary processes in anthropogenic biocenoses, particularly the biological aspects of the process of anthropogeny, is a very important problem.

The second direction is the problem of ontogeny and the study of the mechanisms and laws of the individual development of organisms at all levels. The key problem is cell differentiation and the origination and maintenance of cell diversity in ontogeny. Two aspects are distinguished in it. The first is the study of the maturation, differentiation, and propagation of sex cells, the processes of fertilization, and the genetic regulation of sex. The second includes the study of the differentiation of somatic cells in the process of organogenesis. New methods of obtaining transgene animals, the regulation of their sex, and means of interspecific hybridization, the correction of genetic defects, and the combating of infertility will be proposed. The research results will find application in the treatment of irregularities of hemogenesis and immune deficiency conditions and in the biostimulation of reproduction processes.

The third direction is problems of general genetics. Without the consideration of the principle of genetics the development of other biological disciplines—biochemistry, physiology, biotechnology, zoology, and so on—is impossible at the present level. The tasks of genetics are the knowledge of the mechanisms of heredity and mutability for the purpose of controlling them. The practical output of genetic research is making a significant contribution to agriculture, fish breeding, environmental protection, and health care. The basic directions, in which general genetics will be developed, are mutagenesis and recombination, the structural functions of the genome, the genetics of individual development, human genetics, and the genetics and selection of plants and animals.

It is necessary to say that the level of development of research on general genetics in our country is low. In spite of a number of successes, general genetics in the USSR is substantially inferior to the position which this science holds in the leading capitalist countries. In recent years its position has been worsening and has been approaching a crisis position. The coordination of scientific research, which the department should carry out, is inadequate and we will attempt to rectify this situation. The concentration of forces on the basic directions and the selection of the supervisors of these directions are necessary. However, the department is incapable of solving on its own a large portion of the problems that exist in the research on general genetics. It is a matter of an absolutely inadequate material base—the lack of instruments, equipment, and laboratories facilities. For many years now we have been speaking of the need for the establishment of a centralized nursery of laboratory animals. In several foreign journals they are ceasing to accept our articles, since it is unknown on what animals this experimental work is being done. There are not enough skilled personnel, moreover, their training, especially at agricultural higher educational institutions, is worsening. The organization of institutes of genetics in all major regions of our country is necessary.

The fourth direction is the anthropogenic dynamics of biological systems and the problems of ecology, the first is biological resources and their efficient use and protection. These two directions are closely associated and, for the most part, concern the study of complex superorganism biological systems.

The life-support systems of the biosphere are meant by biological resources. These are resources, which have been involved in the economic activity of man and ensure the existence of life on our planet and the existence of all mankind.

With respect to this research the situation in many regards is forming in not only an unfavorable, but a catastrophic manner. Several natural highly productive ecosystems, for example, the Aral Sea and the Sea of Azov, have been destroyed. In many places the deterioration of soils is occurring, the productivity of pastures

and forests is declining, and oxygen-producing ecosystems are being ruined. Meanwhile in case of the comprehensive, nondepleting, efficient use of ecosystems, which has been organized on a scientific basis, not only the preservation of the environment, which supports human life, but also the significant increase of the products obtained for the national economy are possible. For example, in the next few years in the fish industry a 15-percent increase of the output of sea fishing and a twofold increase of the amount of fresh water fishing are practicable. In forestry there is a 10-percent increase of the yield of useful products, and so on.

In the practical use of biological resources the transition from simple forms of the management of the economy to more complex ones and to the development of biological cultures is necessary. Scientific research will be concentrated in the area of floristics and faunistics, the development of cadasters, the study of behavior, population ecology, and the ascertaining of the principles of the functioning and stability of ecosystems and the principles of the management and protection of biological systems.

In principle the introduction of the mandatory ecological forecasting and evaluation of any project and the organization of a system of ecological monitoring throughout the country are necessary. At present we have extremely little information on the functioning of various ecosystems in different regions of our country and are incapable, as a rule, of making reliable forecasts on the impact of the economic activity of man on ecosystems. The country needs a unified network of well-equipped biological (ecosystem) stations.

For the decisive improvement of the work of the scientific institutions of the General Biology Department their provision with modern equipment and the expansion of laboratory facilities are absolutely necessary. I should direct the attention of the General Assembly to the fact that at the institutes of the General Biology Department, which are located in Moscow and Leningrad, the number of skilled specialists, including doctors of sciences, exceeds the number of specialists of similar skill in outlying areas. But the working conditions of scientific associates in Moscow and Leningrad, as a rule, are worse. It is necessary to develop science in every possible way and uniformly in all regions of our country.

In light of the decisions of the January CPSU Central Committee Plenum it is necessary to change over from the extensive use of scientists in the field of general biology to their intensive use.

Academician Ye.N. Mishustin

I would like to dwell on the questions of agriculture, which were raised in the Basic Directions of USSR Economic and Social Development for 1986-1990 and the Period to 2000, as well as in the Food Program.

In these documents much attention was directed to cereal crops, since they are the basis of our grain fodder fund. This year a crop of 210 million tons of grain, or 18 quintals per hectare, was obtained. These are rather good results for our agriculture, but at the same time in European countries, including the socialist countries, yields of 50 quintals per hectare and more were obtained.

What is the reason for such a lag and how is it to be eliminated?

If we analyze the yields during the past three five-year plans, the average yield of cereals per hectare during the 9th Five-Year Plan was 15 quintals, during the 10th Five-Year Plan—16 quintals, and during the 11th Five-Year Plan—15 quintals. And the situation was especially bad on the best lands of the Central Chernozem Zone, where the average yield during the 9th Five-Year Plan was equal to 18 quintals per hectare, during the 10th Five-Year Plan it declined to 17.5 quintals per hectare, while during the 11th Five-Year Plan it decreased even more—to 15 quintals per hectare. At the same time the delivery of mineral fertilizers to agriculture increased from 1970 to 1986 from 12 million tons to 26 million tons.

It is necessary to note that in the country there are approximately 230 million hectares of arable soil, of them 120 million hectares—these are black soils—are the best soils of the world, gray and soddy podzolic, quite fertile soils make up 60 million hectares. True, adverse climatic conditions often hinder the detection of their fertility. In recent years 26 million tons of mineral fertilizers have been delivered to agriculture and about 1 billion tons of organic fertilizers have been used. The question arises: What is the cause of the low yields of cereals and what should be done to increase them?

It must be noted that we inherited from the tsarist regime exhausted soils. The average yield of cereal crops in tsarist Russia came to only 8.5 quintals per hectare. Thus far it has been possible to increase the yield by approximately twofold, which, however, is obviously insufficient. What methods are we using to increase the yields? This is the use of mineral and organic fertilizers. Calculations show that for the present only half of the substances needed by plants are applied with fertilizers. This especially concerns nitrogen—the basic element which limits the yield of cereals. Nearly half of the nitrogen is taken from the reserves of the soil and soil humus. Thus, annually the soils grow poorer in the reserve of humus, while humus is a source of elements, which increase the fertility of soil, and at the same time a substrate of microorganisms, which provide plants with nutrients and biologically active substances. In particular, for this reason mineral fertilizers act much better on humus soils than on soils with exhausted humus. Thus, the loss of humus is extremely undesirable, it is necessary to keep the content of humus at a constant level and to seek means to increase it.

Of course, it is possible to take the line of increasing the dosages of mineral fertilizers. Now a very small amount of mineral fertilizers is applied to cereal crops, they are distributed very inefficiently. For example, 250 kilograms of nitrogen and even more per hectare are allotted for cotton, several hundred kilograms are also allotted for citrus, which is obviously too much, cereal crops receive only about 30 kilograms, but given the existing yields they take 70-80 kilograms from the soil. True, in the immediate future the output of mineral fertilizers will increase, and 40-45 kilograms of nitrogen per hectare will be applied to cereal crops, which will increase the yield by 3-4 quintals per hectare. In countries, which obtain high yields of cereal crops, the dosage of nitrogen fertilizer is significantly higher; thus, in the FRG and France 130-180 kilograms of nitrogen are used per hectare, in the Netherlands the unusually high norm of 500 kilograms is used. However, it is inefficient to take the path of significantly increasing the norms of mineral nitrogen. The production of mineral fertilizers, especially nitrogen fertilizers, is very expense, and in addition they do not promote the synthesis of humus and do not improve the structure of the soil. The application of large doses of nitrogen to the soil has adverse consequences. Statistics (according to U.S. data) show that the use of high doses of nitrogen fertilizers correlates with the increase of the incidence of stomach cancer as a consequence of the accumulation in agricultural products of nitrates, which are reduced to nitrites and nitrosamines, which have a carcinogenic effect.

Organic fertilizers, mainly manure, are another source of the increase of the yield. In our country about 1 billion tons of manure are being used in agriculture, in 5 years about 1.5 billion tons will be. This will yield approximately 7 tons of organic fertilizers per hectare, which is obviously insufficient.

In the country there are farms, which are obtaining very high yields of grain—50-60 quintals per hectare, as a result of the annual application of high doses of manure fertilizers. At a recent conference of kolkhoz farmers of the Ukraine the speakers noted that even on black soils it is impossible to obtain a grain yield of 50-60 quintals per hectare without having used high doses of manure.

There is a third factor, which is conducive to the sharp increase of the yield and on which I want to dwell—this is biological nitrogen. It is well known that leguminous plants, being in symbiosis with nitrogen-fixing bacteria which form nodules on their root system, substantially enrich the soil layer with nitrogen. Therefore, leguminous crops have begun to be used, but far from uniformly in different countries. Thus, in the USSR 11 percent of the land area is taken up by leguminous crops, while in the United States 26 percent is. In addition to legumes there are microorganisms, to which attention was not directed until recently, but they play no less a role than leguminous crops in the enrichment of soils with nitrogen. These are free-living microorganisms, which fix molecular nitrogen. In recent times much work has been started on the study of what is called "the symbiotic nitrogen feeding" of nonleguminous plants, that is, on the search for free-living microorganisms, which can develop in the root zone of nonleguminous plants and can accumulate nitrogen. The development of an inexpensive, economical methods of enriching the soil with nitrogen can yield substantial practical results. The USSR State Committee for Science and Technology has formulated an interdepartmental program that concerns questions of the use of biological nitrogen in agriculture. The corresponding commission is working vigorously, international symposiums, which are devoted to the discussion of the problem of using biological nitrogen, meet annually.

It must be noted that microbiologists should play the leading role in the introduction of methods of the efficient use of biological nitrogen, inasmuch as they are participating in the work on the formation for different climatic zones of specific crop rotations that ensure the enrichment of the soil with nitrogen. Basic research is playing a decisive role in the problem of mineral and organic nitrogen in farming, inasmuch as here new approaches, particularly genetic approaches, are needed. They can aid significantly the development of the conditions of the effective symbiosis of agricultural plants and microorganisms that improve the nutrition of plants.

Academician M.A. Styrikovich

In his report on the priority directions Academician V.A. Kotelnikov noted the particular significance that the problems of the development of the social sciences, first of all economics and sociology, are acquiring. For the increase of the role of socioeconomic methods of influencing scientific and technical progress and the pace of development of the entire national economy is the basic task of the occurring restructuring. The changeover to full cost accounting, self-support [samookupayemost], and self-financing of enterprises and entire sectors is a mighty factor of acceleration. However, this changeover will be effective only in case of a set of wholesale prices, which would objectively reflect the expenditures on everything being produced by the national economy—from raw material and fuel resources to commodity production. Under the new conditions enterprises will determine the effectiveness of the introduction of any scientific and technical innovation, calculating to a significant degree independently the economic indicators on the basis of wholesale prices.

Unfortunately, the existing prices, especially for fuel and other raw material resources, are far from the total national economic expenditures. The prices have been artificially reduced, therefore, as a rule, not only are the capital investments in new enterprises of the fuel industry not being recovered, but often the current expenditures are also not being recovered, that is, such enterprises are planned to operate at a loss. As a result due to the unjustifiably low wholesale prices a situation is

forming, when the introduction of a number of scientific and technical developments, which are extremely profitable for the entire national economy, is unprofitable for the enterprise.

Here is just one example. Gas turbines with an exhaust temperature of 450-500 decrees Celsius are used at the compressor stations of main gas pipelines. If waste heat recovery boilers were located next to them, two gas turbines could provide sufficient steam for a steam turbine of approximately the same power. That is, it is possible to decrease fuel consumption by a third, and it comes to 60 billion cubic meters of gas a year. Comparatively small additional capital investments yield a large impact. If you calculate with respect to the real expenditures on the obtaining of additional gas—the so-called long-run marginal costs [zamykayushchiye zatraty], the capital investments are recovered in 2-2.5 years (taking into account gas a export prices—in 1 year). However, although the long-run marginal costs [zamykayushchiye zatraty] come to 65 rubles per 1,000 cubic meters of gas, the Ministry of the Gas Industry pays 8 rubles, and for the system of the Ministry of the Gas Industry introduction is recovered in only 18 years, that is, it is unprofitable.

As a result an obviously advisable measure is being unjustifiably delayed and impeded. Such a situation is typical of a significant portion of the measures on energy conservation—the basis of our Energy Program. For we propose to meet 70 percent of the total increase of consumption by saving. The unjustifiably low prices for fuel and several organizational messes had the result that in our country in the past 10 years the absolute expenditures of fuel have increased by 20 percent, while in developed capitalist countries they have declined by 20 percent. Energy conservation without proper economic stimulation is henceforth also threatened, especially under the conditions of the economic independence of enterprises.

Under these conditions the cardinal reform of prices is necessary. Such a reform is being formulated, but this is a very complicated task, since the change of prices for fuel and raw materials will cause an increase of prices for all products and in conformity with this both wholesale and retail prices and the wage should be changed.

This reform affects all departments, but since their interests to a significant extent are opposite, the active participation of the USSR Academy of Sciences as the highest extradepartmental scientific organization is important in the development of the new system of prices.

Of course, the responsibility for the most part rests with the Economics Department, but other departments should also make their contribution. In particular, the Physical Technical Problems of Power Engineering Department in scientific and technical calculations should rely not on prices, but on the long-run marginal costs [zamykayushchiye zatraty], carefully trying to see to it for many years that wholesale prices would approximate their level. Now, we will hope, this will happen.

The second important question is ecology. In recent years the need to take into account the value of the additional equipment, which is connected with environmental protection, appeared when determining the use value of various types of fuel. For example, it was believed that fuel oil and gas are the same, since at thermal electric power plants the same units run on them. However, gas is an ideally clean fuel, which does not contain either ash or sulfur and makes it possible to use efficiently new equipment, such as high temperature gas turbines, which cannot run on fuel oil. But in addition to the increase of the efficiency of electric power plants, which is connected with this, it is necessary to take into account the harm, which the national economy bears from the discharge of sulfur oxides during the combustion of sulfurous fuel oil, while it, according to a number of estimates, approximates the very price of fuel. The specific (per unit of calorie content) content of sulfur in fuel leads to a very large difference in the estimate of the use value of fuel. Thus, low-sulfur forge and high-sulfur (eight- to tenfold more!) Donetsk coals are considered equivalent in tons of standard fuel, but there is an enormous difference in them with allowance made for ecology.

Unfortunately, at the Academy of Sciences work on ecological problems is not being performed in the necessary amount. In general in our country insufficient attention and capital are being devoted for the present to this question.

In his report Academician V.A. Kotelnikov noted that half as much capital is being spent on research on biology in our country than in the United States. In the area of ecological research the situation is even worse. While, for example, in the United States *in the past year* $1 billion were allocated for ecological research just with respect to the federal budget, here *for the five-year plan* about 30 million rubles have been allocated for the scientific program "Environmental Protection." It is clear that this is an obviously intolerable ratio. Therefore, I appeal on behalf of power engineers and the representatives of other fields of both academic and sectorial science and industry to broaden the stu 'ies of the influence of contaminants of the air on the biosphere, water, soil, and the capacity for work and health of man.

Academician A.D. Aleksandrov

I fully agree with the high appraisal of the report of V.A. Kotelnikov in the other statements, and first of all because he attaches vital importance to the development of the sciences of socialist society, particularly sociology. I want to stress that this also applies to so-called microsociology—the examination of the working conditions in collectives, including scientific collectives. I will venture (perhaps, not entirely legitimately) to supplement the

assertion of V.A. Kotelnikov about what is needed for the development of science. In addition to computers, materials, and instruments a fourth factor is necessary—a healthy moral atmosphere in the collective, common enthusiasm, and dedication to the cause. Without this no instruments will yield the necessary results.

I will venture to dwell on one example. An obviously abnormal situation has formed at the Academy Campus of the Siberian Department of the USSR Academy of Sciences. A group of people, who, in particular, are engaging in the spread of political slanders meant for leading scientists, has appeared there. I will not repeat them, this is, unfortunately, a well-known fact. And this is developing into practical consequences: they do not hire one person, they dismiss another at the university, they do not appoint a third to the position which he has actually held for a long time, and so on. All this is happening not for the first year.

Previously, when M.A. Lavrentyev, then G.I. Marchuk headed the department, nothing of the sort existed, but now, unfortunately, the situation has acquired such a nature, and particularly because this outrage has not encountered opposition. While now, apparently, it will not be that easy to put an end to it.

The article of a certain Merzlyakov, which appeared several years in the newspaper *Nauka v Sibiri*, was one of the factors that played its role. In the article mud was thrown at the scientific associates of the Academy Campus and a slanderous hint about our most prominent mathematician Andrey Nikolayevich Kolmogorov was dropped.

A.N. Kolmogorov is the pride of Russian science, this is a man who by the awarding to him of an international prize in mathematics was recognized as the primary mathematician of the middle of the 20th century. An international commission, of which I was also a member, decided this. The opinion of such a person as Heisenberg, whose name is well known in science, played a special role. The article of Merzlyakov contained a hint, which was then inflated by other people to overt statements. I will take the liberty to quote the abominable opinion. A certain philosopher named Turchenko, in addressing a philosophical seminar at the Institute of Soil Science and Agrochemistry of the Siberian Department of the USSR Academy of Sciences, said: "Academician Kolmogorov ruined mathematical education in the school, thereby harmed our defensive capability, and for this was awarded a prize of Israel, which is hostile to our state." This is political slander, and grown-up people, people of my age know what kind of consequences this could have had at one time. Addressing the scientific council of our institute in this regard, I said that the great Russian scientist Nikolay Ivanovich Vavilov died in a prison hospital precisely because there were people who cast aspersions of this sort on him.

Nevertheless the formed situation did not immediately evoke proper condemnation. At a meeting of the department 2 years ago I quoted the statement of Turchenko and expected that it would arouse indignation. But Chairman of the Siberian Department V.A. Koptyug nullified my statement, having said that this is the personal opinion of Merzlyakov. What is happening? On 18 January of this year a certain mathematics instructor Shatalov at a school of Donetsk, speaking in Leningrad to an audience of 1,000 teachers and students, quoted the statement of Turchenko, citing the newspaper *Nauka v Sibiri*. The newspaper contained only a hint, which was condemned in the decision of the bureau of the Mathematics Department, but this did not have the proper effect.

I believe that the Presidium of the USSR Academy of Sciences and the party Central Committee should intervene in the formed situation. There already exists now a decision of the rayon committee, which condemns such actions, but they are continuing. The restructuring now taking place includes not only scientific and technical, but also moral progress. M.S. Gorbachev has constantly stressed this in his statements. The academy is the headquarters of Soviet science and the leading detachment of Soviet scientists. Holding the leading position in the development of scientific and technical progress, we should also head moral progress, which is inseparably connected with it.

[Editorial note] President of the USSR Academy of Sciences in the comments on the statement of A.D. Aleksandrov stressed that in case of broad democracy, when the most urgent questions can be discussed, criticism should be constructive and well-meaning. Since A.D. Aleksandrov has turned to the Presidium of the USSR Academy of Sciences, a working group for the specific examination of the question raised by him will be organized.

Corresponding Member of the USSR Academy of Sciences P.A. Nikolayev, Acting Academician Secretary of the Literature and Language Department

There is nothing surprising in the fact that the General Assembly of the Literature and Language Department, which was held on 9 March, took place with rare united activity—this is characteristic of all the departments. Various words, which ambiguously characterize our activity, were spoken at the assembly. It was said that philologists do not have an inferiority complex and they do not have to speak with regard to individual fields of knowledge, that here one should strive for the achievement of the world level—it is natural, and has been so for a long time, in these fields. It cannot be said that this is a great merit, it happens that the world level is also not very high, this is not surprising. Such fields of knowledge include general linguistics, many directions of art criticism and literary scholarship, medieval studies, whether they apply to Russia or Byzantium, classical philology, and Indo-European studies in their linguistic variant.

The last was recently called in the press the sensation of the late 20th century and from this standpoint is being discussed in the world science, European and American, of human speech.

The successes of our Chinese language experts are significant. Nearly all our national languages and the languages of the world are being studied most thoroughly. A five-volume history of 20th century music has been prepared. In recent years many national literatures have been studied and considerable research has been completed. Is it really possible in a few minutes to tell about the work of many institutes of our country, which are included in the sphere of activity of the Literature and Language Department, and institutes which are dealing with linguistics and the artistic culture of the country and the entire world?

At the General Assembly of the department demanding words, self-critical acknowledgments, and even alarm were heard most strongly. What is worrying us? The first thing is, how is one to combine in linguistics traditional and new methods, how is one to find a common language between historical grammar experts and mathematical linguists? How is one to unite in this field, and in all others, the efforts of experienced scientists with their established methods and leaning toward traditional methodology and of young scientists with their leaning toward experimentation? After the war some scientists, our teachers, said: they are appealing to us for the unity of old and young personnel. How are we to be united, if we, the old scientists, as they say, have the burden of old mistakes, while you, the young scientists, have nothing? In some instances this situation is retaining its force.

Our science once wavered under the pressure of quantitative methods, but as a result held out. More productive cooperation with the natural sciences emerged.

Russian philology, for reasons of an intrastate and international nature, needs particular attention. Our national policy cannot be implemented without a proper understanding of the place of the Russian language and the other national languages. Basic works on practically all the languages of the peoples of the USSR are being written and, of course, Russian as a means of international contact is being studied. But this work, unfortunately, does not conform to the required scale and, let us state frankly, it is being carried out without a clear understanding of the objective social and general cultural processes in the republics and with some subjective extremes that at times, although extremely rarely, are of a nationalistic nature.

Russian is also becoming a means of international, interstate contact. This problem is exceptionally important in the present situation. The International Association of Teachers of the Russian Language and Literature exists, 120,000 experts in Russian philology and representatives of 69 countries belong to it. There are data that in recent times the interest in Russian culture, literature, and language has increased in the world. In February 1987 we received the president and vice president of the American society of Russian philologists. They reported that in 1986 in America the number of people, who deal professionally with Russian culture and the Russian language, had increased by 15 percent; this year a 27-percent increase is planned.

The next congress of Russian philologists is being held in Moscow in August 1990. Unfortunately, the scientific institutions of the Academy of Sciences in essence have held aloof from this movement, the process of familiarizing scientists with this most important public movement in practice is not occurring. We will attempt to rectify this situation, but for this we need help.

Specialists are working under difficult conditions, the material and technical base is very poor. Recently the newspaper *Pravda* reported this with alarm. And convincing evidence is the fact that there is no specialized academic journal *Russkiy Yazyk*. In American there is, but not here. We have already more than once request that this publication be permitted, we would like our requests to be heard.

And the most sore subject is personnel. I have already had occasion to speak in the Presidium of the USSR Academy of Sciences in the Social Sciences Section about the alarm that we professors are experiencing. In particular, I, as a professor of Moscow University, have been experiencing alarm for nearly 20 years now because the least trained people are coming to our Russian Department, the strongest portion of the young people are going to the Romance and Germanic Department. Who they will be after graduating from the Swedish or Dutch department does not even interest them, it is important that they would know Swedish or Dutch. We are inducing people primarily from the provinces to study domestic culture and history. It is very important that the rising generation would understand that this is our duty to domestic culture—to study it just as intensively as we have been studying in recent years foreign languages and foreign literature.

A few words about the study of Russian artistic culture. P.N. Fedoseyev quite correctly stated that artistic culture is now developing in a complex and contradictory manner. But this is still not the trouble. The trouble lies in the interpretation of this complex, contradictory process, especially in the treatment of those phenomena which in recent times have been influencing mass consciousness. The works of well-known and scarcely known writers and figures of culture in recent years have begun to be grasped more and more often and actively by mass consciousness. This is natural and correct.

What is our alarm here and what are we planning in this connection? Our task is to firmly establish the sovereignty of our science and its equality before the form of artistic consciousness, which forms mass consciousness. Our social sciences and the philological sciences of our

department are not active in this sense. We have lost sight of the task of the corresponding formation of mass consciousness and have committed a number of miscalculations. Unsystematized forms of mass consciousness oppose, offer resistance to our scientific recommendations. We voiced them at the All-Union Conference of Heads of Chairs of the Social Sciences, but in recent months the resistance to scientific recommendations has increased greatly.

I would like to cite one typical example. It is well known what a number of scarcely known writers they have begun to publish. This is good, but it is important how these names are interpreted. Particularly if it is a question of writers, before whom there is a sense of guilt. But several emotional exaggerations are also encountered. For we are not guilty before V.V. Nabokov, so why must he be depicted in such a way that he is all but a victim of fascism? For he, a prominent 20th century writer, wrote in 1944 to the Soviet people words which cannot be forgiven. It should be stressed that glasnost should apply to all phenomena entirely, with allowance made for all their aspects.

Corresponding Member of the USSR Academy of Sciences Yu.I. Polyanskiy

In the matter of the restructuring of the work of the Academy of Sciences and its departments there is one aspect of scientific life, which for some reason has not been examined and discussed. In accordance with my deepest conviction and work experience, it is extremely important. It is a matter of scientific societies attached to the academy. The entire system of scientific societies is a powerful lever of the surmounting of departmental barriers. Scientists who work in different departments are united in scientific societies, they hold scientific congresses and symposiums, but this work does have a profound effect on the life of the Academy of Sciences. In my opinion, this is a very great mistake. The question of scientific societies has never been discussed in the Presidium. From the experience of my work as president of the All-Union Society of Protozoologists I am certain of the importance of this question. An active exchange of opinions and information takes place at the meetings of scientific societies. No instructions will replace this human contact.

Therefore, I appeal for the drafting of a statute on scientific societies at the Academy of Sciences. It is necessary to use this important means of influence of academic science on nonacademic science, although, of course, science is unified.

Another question concerns personnel. I want to speak about the situation that has formed with respect to scientific associates, who have the title of candidates of sciences, or even do not have it, among whom there is a large stratum of people who are working most actively in science. Upon reaching retirement age they withdraw from scientific activity, and the experience and knowledge gained by them cannot be used. Having retired, they can work as janitors, this is not condemned, this is permitted. But how is one to maintain their contact with science? Means of allocating if only a small fund of finances should be found so that, while being retirees, they could continue creative scientific work, train young people, and so on.

And there is a last thing, which is also connected with personnel questions. Why among associates of the academy of a relatively young age are there so relatively few creatively working people? Because we take on at the academy to a significant degree casual people. The very deep gap between the Academy of Sciences and higher educational institutions is one of the most important shortcomings of the organization of science in our country. It is necessary that associates of the academy would educate students at higher educational institutions and would give lectures there and that there would be professors who work at the academy. And not only professors, but also lower categories. Only when higher educational institutions and the Academy of Sciences are two aspects of the common phenomenon of social and scientific life, can the question of scientists be properly settled. Young specialists, who have been appropriately trained at a higher educational institution, will be able to form the basic scientific potential for institutes of the Academy of Sciences.

Academician V.V. Menner

In my statement I will not touch upon the major problems in the activity of the academy, I will dwell on the "trifles" which represent very serious difficulties in our work.

In discussing the problem of personnel, we, on the one hand, note their acute shortage and, on the other, at 60 see off to retirement people who are still entirely able to work. Skilled specialists—paleontologists, petrographers, and geologists, many of whom are capable of doing work of real value—are retiring. It is easy to be convinced of this from the amount of their output—articles, books, and so on. That is why it is extremely important to think over the question of how to provide such people with work, for example, in some collectives that could use their capacity for work.

At the general assemblies of the Academy of Sciences I have repeatedly spoken on the question of libraries and now need to speak on it again. It is not possible at all to perform scientific work without libraries, but our libraries are in an extremely difficult position. They cannot accommodate even the old collections, not to mention new acquisitions. Meanwhile the question of building libraries is in last place. The organization of a depository for the storage of rare old books, which, it happens, are simply discarded, which is absolutely intolerable, could be a way out of the formed situation. Among them, of course, there can be books, which are available in all

libraries or which are not requested, and they hinder the work of libraries. But there can also be such books, which cost the Soviet Union large currency allocations and the loss of which can then turn into a tragedy. That is why the organization of a depository is absolutely necessary, and it is necessary to think over how best to do this.

We have been saying a lot about the increase of work quality. And it is very pleasant to hear about the great achievements of Soviet science, which in a number of directions is actually at the world level. Unfortunately, we cannot assert that the question of the extensive dissemination of the knowledge and achievements, which are the pride of Soviet science, has been properly posed here.

The number of printed works for individual institutes of the Academy of Sciences is continuously decreasing, although the Nauka Publishing House is the largest in the world. Previously the Geology Institute of the USSR Academy of Sciences annually printed 380 sheets, but now prints only 250, or else 220. Here a significant portion of the works completed by the institute wait their turn for 2, or else 3 years. But this is not very serious, the saddest thing is that the quality of printing is constantly decreasing. The exceptionally great importance of a large number of our works, particularly the collective monograph "Vendskaya sistema" [The Venedi System], has been mentioned at the General Assembly. The tables in this monograph, which are very important for paleontological work, are so poorly printed (as compared with foreign publications) that it is simply impossible to obtain much information from them. It is necessary to increase sharply the quality of scientific printing products at the Nauka Publishing House.

In conclusion I want to note that at higher educational institutions of the geological type the competitions and the number of matriculants are decreasing all the time. In this connection the promotion of geological knowledge among school children is extremely important. In Moscow there were always a geological and a mineralogical museum, but now they have been closed and school children cannot visit them. They have been closed for more than a year. It is absolutely necessary not to curtail, but to revive the activity of the museums, which could promote geological knowledge among school children. Scientific societies are now attempting to correct this, but they have been placed under such conditions that they cannot work normally. Precisely museums and scientific societies are extremely important factors that ensure the growth of young personnel. I recall my own youth, when for the first time I went to the Moscow Society of Naturalists, in which my growth from a school child to an academician actually took place. That is why, when we speak of the stimulation of the scientific work of school children and students of higher educational institutions, we should never forget the role in this process, which the activity of scientific societies, which, unfortunately, are now under conditions that are exceptionally difficult and not at all becoming to them, is playing.

Vice President of the USSR Academy of Sciences Academician V.A. Koptyug, Chairman of the Siberian Department of the USSR Academy of Sciences

A rather large number of examples of the work of institutes of the Siberian Department were cited in the statements of the chairmen of the sections of the Presidium of the USSR Academy of Sciences on the results of the development of sciences during the period under review. Therefore, without dwelling on this aspect of the activity of the department, it is expedient for me to focus on scientific organizational questions.

The Presidium of the USSR Academy of Sciences has performed a large amount of work in the area of the reform of the structure and forms of management of the academy as a whole. Specific steps in a number of directions were also taken at the Siberian Department of the Academy of Sciences. I will touch upon several problems that are arising here.

In 1986 we continued to improve the system of the advance of developments of institutes of the Siberian Department into the national economy. We continued the policy of consolidating the design and pilot production base, by establishing new design bureaus. The Nauka Technological Design Bureau in Krasnoyarsk and the technological design bureau of high-power electronics in Tomsk were organized. The construction of the appropriate work areas was incorporated in the plans of the 12th Five-Year Plan.

One of the basic difficulties, which are arising here, is the increase of the size of the staffs for the section of scientific service, moreover, not only for the design bureaus that are now being set up, but also for those which already exist, have gained strength, and could work on a larger scale, if their personnel were increased. It seems to us that this problem is quite common for many institutions of the Academy of Sciences, and that is why in the draft of the mentioned decree on the development of the USSR Academy of Sciences to 2000 it is absolutely necessary to provide for the settlement of this question for the academy as a whole.

During the past year the process of the further integration of already formed institutes, design organizations, and pilot works continued. There were established: the Informatika Scientific Technical Complex, which unites the efforts of the Computer Center of the Siberian Department of the Academy of Sciences, the Main Production Computer Center, and the Special Design Bureau of Computer Hardware; a scientific production complex based on the Institute of Cytology and Genetics and the Altayskiy and Novosibirsk experimental farms; the Sigma Engineering Production Complex based on the Electronic Instrument Making Department of the Special Design Bureau of Computer Hardware and the pilot plant of the Siberian Department of the Academy of Sciences; the Center of Plasma Technology of the Ministry of Chemical Machine Building and the Siberian

Department of the Academy of Sciences, which is oriented toward the developments first of all of the Institute of Thermal Physics with the enlistment of other organizations of the Siberian Department of the USSR Academy of Sciences.

Very significant work was performed on the formation and development of the Katalizator Interbranch Scientific Technical Complex, of which the Institute of Catalysis of the Siberian Department is the main organization. In the direction of the development of this complex many difficulties still have to be overcome and a number of serious problems have to be solved. I would like to stress that the experience, which we have already gained in developing the work of the Katalizator Interbranch Scientific Technical Complex, confirms how important and necessary a form of the organization of scientific research and especially introduction this is. I will touch upon only one aspect: the interbranch scientific technical complex is making it possible to use planning levers very effectively for the advance of developments of academic institutes into the national economy. While addressing the preceding General Assembly, I noted that the Siberian Department of the USSR Academy of Sciences is using these levers quite vigorously. But when we sought the inclusion of developments on catalysis in the state plan of the 12th Five-Year Plan, we succeeded at the cost of great efforts in including only three such developments. The establishment of the interbranch scientific technical complex immediately increased the number of developments, which were included in the state plan, to 12 and the number of assignments to 60.

The question of establishing two new regional departments—the Ural and Far Eastern departments of the USSR Academy of Sciences—is being settled at this assembly. This is very important for the development of the entire eastern territory of the country, and the new departments, just as the Siberian Department, have much work to do in the interests of their regions.

As is known, we have the large Sibir Comprehensive Program of Scientific Research, within which a large number of tasks of a regional nature are being accomplished. But whereas previously, when performing this work, we leaned in our relations mainly toward union ministries, after the 27th party congress the RSFSR Council of Ministers posed very urgently the question of expanding our interaction with sectors and ministries of the RSFSR.

We have already succeeded in doing something in this direction. Within the Sibir Program the special Nauchno-tekhnicheskiy progress Rossiyskoy Federatsii Complex is being formed, coordinating agreements have been concluded with the majority of ministries of the republic, the work of the Republic Engineering Technical Center for Protective Coatings in Tomsk has been developed and is now proceeding on the broad front, and so on.

Now, when two new regional departments have been established, the organization of their cooperation with ministries and departments of the RSFSR, as well as the coordination of the work in this direction of all three regional departments are becoming an urgent task.

The January CPSU Central Committee Plenum stressed that personnel policy is one of the key tasks at present and the most important lever of all the work on restructuring. Academician G.I. Marchuk in his opening report covered this problem as applied to the Academy of Sciences as a whole. As to the Siberian Department, with respect to the top level—the directors of institutes—we have to a significant degree completed the necessary work, and we are now faced with the accomplishment of the next task, namely the rejuvenation of personnel as a whole. It is necessary to increase the influx of young specialists into all the subdivisions of the Siberian Department of the USSR Academy of Sciences.

The accomplishment of this task involves first of all the provision of housing. On the one hand, the improvement of the housing conditions of the already working contingent and, on the other, the allocation of living space to young specialists at a leading pace are required. It seems that for this it is necessary to adopt decisions of the Presidium of the USSR Academy of Sciences on the reservation and distribution out of general turn of a portion of the housing for young people.

One of the most important aspects of restructuring is the more extensive coverage of urgent questions, the broadening of glasnost, and the improvement of the moral and psychological climate in all the subdivisions of the academy and in all collectives. Criticism, moreover, regardless of authorities, is needed, but the criticism should be businesslike, specific, and constructive.

Academician A.D. Aleksandrov in his statement recalled an old incident, when the clash of opinions of two groups of mathematicians found reflection—in a subjective evaluation and with insulting hints—on the pages of our newspaper *Nauka v Sibiri* in February 1983 in one of the articles. This incident was considered by the Presidium of the Siberian Department, the publication of this material by the newspaper was condemned, and the appropriate decisions were made. It is not very clear why one had to return to this after so many years.

At the same time it is impossible not to agree that at the present stage of the democratization of the life of society and the broadening of glasnost, criticism, and self-criticism the closest attention should be devoted to the ideological aspects of restructuring. Unfortunately, along with the healthy processes of the stimulation of social life and the extensive discussion of difficult problems of the preceding and present periods one also has occasion to be faced with the negative phenomena of fault finding, the promotion of questionable ideas and conjectures, and the indiscriminate overthrow of authorities. At the Novosibirsk Scientific Center elements of this have

appeared in the activity of the rayon organization of the voluntary society of sobriety and the Pamyat Historical Patriotic Club. Means of eliminating distortions in the activity of these necessary and useful organizations were considered by the Presidium of the Siberian Department of the USSR Academy of Sciences and by the rayon party committee. We all bear responsibility for the aiming of increasing public activity at the constructive discussion and surmounting of the accumulated problems.

Academician L.I. Sedov

At the General Assembly much has been said about the importance of modern mathematics and computers. Meanwhile the question of the use and great importance of mathematics in all intelligent theories and in computer applications was substantiated and understood long ago and well, in this connection far-reaching vigorous steps have already been taken.

From the report of President of the USSR Academy of Sciences Academician G.I. Marchuk it is evident that we already have tangible achievements in the area of the development of computer technology, and it is not necessary to give reasons here and now for the necessity of introducing and using computers. Everything is being done so that the most diverse computers would become a part of everyday life and would perform their functions in the national economy and in general wherever they are needed, including in science. A similar situation exists in astronomy, in which the basic tool of observations is telescopes, or in biology, in which it is impossible to do without powerful microscopes. Of course, in science in general progress is also connected with advanced means of computations, the automatic processing of the results of experiments, and their management. But at the same time it is also necessary to see to it that the potentials of talented, highly educated scientists, who, strictly speaking, are also the creative authors of what is new, original, and advanced, would also be fully displayed.

It is important that competent people, whom it is necessary to afford the opportunity to work productively and creatively, would supervise scientific work and production. Many of our troubles are due not to the fact that something is lacking, but to the fact that incompetent people are acting irresponsibly.

In general there are not that many people who actively advance science, and, so that they would work successfully, it is necessary to give them more attention and opportunities to train young specialists and to have fruitfully working schools, which are reinforced without obstacles with young promising scientists.

It is necessary to support in every way leading scientific schools, a high level of instruction at higher educational institutions, as well as a high level of textbooks. Incidentally, the level of instruction even at Moscow University in individual cases leaves much to be desired.

USSR Minister of Higher and Secondary Specialized Education G.A. Yagodin in his statement here noted that the diplomas of a higher educational institution are often given not to those who deserve them. In our country too few young specialists, who can ensure progress in science and production, are being attracted.

It is impossible to train skilled scientific successors without good textbooks. It is important that textbooks would be not only good, but also "correct." Meanwhile not simply procedurally poor textbooks, but textbooks containing unforgivable scientific errors are being published. This is happening because the writing of such textbooks is supported by influential people who are pursuing only personal goals, without regard for the skill of the authors and the modern achievements of science. Unfortunately, such an abnormal situation also exists at the Academy of Sciences. I would ask that more attention be directed to the publication of scientific literature, especially textbooks, than has been thus far. Poor textbooks, which are published in large editions, cripple entire generations of young people.

It is necessary to note that the indicated shortcomings in publications of the Academy of Sciences are being maintained in a number of cases by the existence of cliques, at times of a low scientific level, which persistently use their influence for ensuring themselves uncontrolled prosperity.

A few words about criticism and self-criticism. Much is being said about this, but criticism is actually not permitted. Critical scientific articles are not published, but if at times they do get into the press, they are glossed over. The opinion exists that all the same criticism will now be developed, for the progress of science is possible only if there are criticism and debates, otherwise the result will be stagnation.

It is not an easy matter to criticize influential people, this can come to a bad end and nearly always does come to a bad end. And all the same a scientist not interested in a personal career may decide on criticism, in spite of the small chance of the effectiveness of the criticism, since the main thing is that criticism does not have the proper influence, inasmuch as the matter in the end reduces merely to the insulting of the critic. In this connection, unfortunately, among scientists the opinion about the futility and the unrespectability of engaging in criticism has taken root. This style proved to be personally very useful for scientists, but it is impossible to recognize it as a positive phenomenon from the standpoint of scientific and public interests.

The restructuring of the curricula is now under way at higher educational institutions. In the curricula there are disciplines—atheism, ethics, and law—which are interesting and useful, but I do not known if they are topical. For it is a fact that among students there are few believers, uneducated rude people, and future offenders. A significant number of hours, the reduction of which is

not permitted, are being allotted for these subjects. Only the courses in a specialty, for which about half the time of instruction at higher educational institutions is allotted, are liable to reductions. However, science is now so large that it is still necessary to select the most important disciplines for specialists.

Academician A.G. Yegorov, Academician Secretary of the Philosophy and Law Department

Our present assembly is unusual. It is actually a matter of the state of affairs at the Academy of Sciences and of its prospects.

We discussed many questions, which are connected with the development of philosophy, law, sociology, psychology, the natural sciences, and technology, at the annual assembly of the department. But there are also general problems that merit attention, and here I would like to speak—even though briefly—about several of them.

First of all I will note that the new thinking, which is spoken about in party documents, is dialectical materialistic thinking which has been turned toward knowledge of modern reality in its essential connections and relations, in its development, and in all its contradictions; this is thinking which is equal to the present level of development of science and culture. And that is why the development of Marxist-Leninist methodology, which even in its underlying principles is not standing still, but is developing, is at the center of the concerns of our department. And although in the theory of materialistic dialectics we have made progress in recent years, to which a number of multivolume works and monographs on this theme testify, it is impossible not to admit that here we still have much to do in order reveal the present form of Marxist-Leninist philosophy in conformity with new social experience and the achievements of scientific knowledge and culture. We are now also dealing with this. I also have in mind the work on the philosophical generalization of the data of the modern natural sciences and technology under the conditions of the scientific and technical revolution. And the study of the intricate complex of the intraformational dialectics of the evolution and revolution of socialist society, its functioning and development, its nonantagonistic contradictions, and the mechanism of their resolution. And the analysis of the trends and laws of our era, which are giving a new ring to such problems as humanism, civilization, culture, and the struggle for peace and social progress.

It is natural that the new problems require new solutions—methodological and procedural, and presume the in-depth elaboration of the theoretical bases of restructuring and the search for specific forms of the transition of Soviet society to new levels. Here we now must not only solve new problems, but also overcome the consequences of the situation which formed over many years in the social sciences. Much has to be started over again, by surmounting nearly always the barrier of oversimplified and dogmatic constructs. Moreover, one must also not fail to notice the fact that the interpretation of the latest achievements of the natural sciences from a philosophical standpoint is often dragged out, there are many "blank spots" in the study of important problems (for example, in the area of national relations, ethics, and the motive forces of socialist society). In social research they do not always arrive at the motives of human actions and their stimulation in the necessary direction. The application of materialistic dialectics to the knowledge of new historical experience and to applied research also leaves much to be desired.

There is no doubt that the elaboration of priority themes, which are connected with the acceleration of the socioeconomic development of the country on the basis of scientific and technical progress, the extension of the social self-government of the people, and the stimulation of the human factor will enable us to solve problems more successfully and to strengthen the synthesizing, philosophical organizing, and integrating functions of philosophical science. Moreover, the priority themes will also help to more thoroughly understand and reveal the strategy of the development of those social spheres, with which our main institutes and the department as a whole are dealing.

At the same time I believe that, first, there are still a few too many priority themes at the Academy of Sciences. This cannot but affect the concentration of forces and assets on the main directions of science. But the primary thing is that it is necessary to study all these themes and the programs that follow from them on a broader comprehensive goal basis. It is necessary to overcome the well-known gap, which exists between the natural sciences and the technical sciences, on the one hand, and the social sciences, on the other. It is necessary to formulate goal programs, which would unite the natural sciences, engineering, technology, and the social sciences into an integral system, at the center of which is man, for he links together all aspects of social life and scientific, technical, social, and spiritual progress.

Second, I would also like to direct attention to the fact that too little attention is being devoted at the Academy of Sciences to the methodological and procedural problems of forecasting. Thus, at the institutes of our department it is possible to count on your fingers the people who would deal with them professionally. Consequently, it is also necessary to seek forms of the effective settlement of this question on a solid foundation.

Third, the time has come to provide the efficient coordination and a well-balanced system of the interaction of all the information subdivisions at the Academy of Sciences, and subsequently on the scale of the entire country, in order to know in good time what is being done in world science and not to miss anything important while taking our own path. Now, so to speak, the information gross, and not the mobile and skillful selection and the evaluation of the necessary information and its quality, is at the center of our attention.

Of course, the integration of scientific knowledge and the coordination of research do not reduce to information exchange. They also encompass the constant interaction of departments with higher educational institutions, with sectorial science, and with the republics, where the system of scientific institutions—at least of our type—requires modernization. But information is also an important factor in the organization of scientific work.

Further, as is known, philosophers and other social scientists at the 27th CPSU Congress were severely, but justly criticized for a certain isolation from practice and its needs. In order to correct such a situation, it is necessary to update significantly the content and forms of scientific work. But certain changes for the better already exist. Suffice it to say that the institutes of the department have support centers, at which different versions of their recommendations are analyzed, and are relying more and more extensively on the social experiment. And although the practical significance of the social sciences does not reduce to the economic impact—they are in their essence of sociopolitical importance—we will henceforth also intensify the work in this important direction. In this connection I will also note that institutes of the department now have quite a few cost accounting themes and jobs, which are being carried out on a contractual basis. In particular, the Institute of Psychology of the USSR Academy of Sciences, many of whose developments are directly aimed at practice, is now conducting talks—and very successful ones—on the establishment under its procedural supervision of scientific production complexes. We are attaching great importance to them. Already solely because we do not have the opportunities and conditions for the introduction of innovations directly into production, but with the organization of scientific production complexes we will obtain such opportunities.

Incidentally, there are also general questions here. We hope that the Presidium of the USSR Academy of Sciences will give us, if there is a need for this, support in the establishment of scientific production complexes. Now at the Academy of Sciences it is necessary to examine more thoroughly and closely than ever the interrelations of academic and sectorial science, taking into account that the pressure of applied problems with each year is increasing and will increase, also engrossing more and more the humanities institutes of the Academy of Sciences. The system of reimbursement of the expenses of the Academy of Sciences by the transfer to it by sectors of certain limits on labor is by no means a solution of the problem. This, I believe, is clear to everyone. And another thing. We at the department are now trying to determine an efficient ratio between applied and basic research. Here, too, far from everything depends on us. Without the participation of the Presidium of the Academy of Sciences we will not be able to properly solve this problem. Finally, the scientific potential, which is concentrated at the Academy of Sciences, should be used more effectively and better. Let us take as an example problem analysis reports. We prepare many of them. In my opinion, too many, for among them there are also those which do not require much knowledge and ability. Here it is also possible to manage without academic institutes. But it is difficult for institutes to reject these and other particular assignments, which come from recognized organizations and departments. And they work on them—often to the detriment of basic research, to the detriment of the solution of important socioeconomic, political, and ideological problems.

Of course, in the departments, while carrying out restructuring, we must also think about the more strict distribution of labor among associatesat the institutes and about their more strict specialization. We are dealing with this. But the whole trouble is that the professional level of many scientific associates even at the Academy of Sciences does not conform to the present requirements, while this is paralyzing the changeover of science to the path of intensive development.

The roots of such a situation extend to higher educational institutions and even the secondary school. And, of course, to graduate studies. In this connection the Presidium of the Academy of Sciences should direct more attention to graduate studies. Suffice it to say that the number of places, which are being allotted to us for basic full-time graduate studies which are called upon to train specialists for the Academy of Sciences, is negligible. The emphasis is being placed on special-purpose graduate studies, which in their existing form became obsolete long ago.

In concluding I would especially like to note that the main thing now, as the January (1987) CPSU Central Committee Plenum stressed, is to overcome oversimplification in thinking, which is leading to serious errors and negative phenomena. In other words, to firmly establish everywhere and anywhere dialectical materialistic realism in thinking and in deeds. This is our common task.

Corresponding Member of the USSR Academy of Sciences G.R. Ivanitskiy

In the process of restructuring the work of the USSR Academy of Sciences it also seems necessary to me to examine the questions which concern the interdepartmental relations between the Academy of Sciences and other institutions. The essence of my statement also reduces to the making of one request to the Presidium of the Academy of Sciences.

I will begin with the request. The majority of those present probably know that in 1980 the Institute of Biological Physics of the USSR Academy of Sciences began work on the development of a compound of "synthetic blood" and in 3 years at the cost of great efforts made it. However, during the scientific research work the instructions of the USSR Ministry of Health were violated. Law enforcement organs dealt with the

resolution of the conflict, but did not examine the essence of the work itself and merely relied on the instructions of the USSR Ministry of Health.

Instead of considering whether or not the instructions of the Ministry of Health had been properly drawn up, they decided to halt the work and to punish the developers. Therefore, the moral harm from what happened, it seems to me, is enormous.

However, this is already a question of the past. The question of the future is whether the production of the blood substitute compound, which is vitally necessary for modern medicine for the solution of the problem of traumatology and even the combating of the spread of AIDS, will actually be carried out. The work has been halted, and our international priority may be lost.

I have a request—to return once again to this problem, to examine it, and in the end to familiarize me with the complaints which have been lodged directly against me. It is desirable to discuss the question with USSR Minister of Health Academician Ye.I. Chazov. If Soviet medicine needs this work, it is necessary to produce the finished product.

Further I want to touch upon the questions of the interrelations of biophysics and general biology, including ecology. It is no secret that in the matter of protecting living nature we often violate ecological principles. The Chernobyl accident roused an element of self-consciousness in society and forced us to think about the global problems of the attitude toward our planet. In his statement Academician B.Ye. Sokolov spoke about the shortcomings in the development of work on studies of biological resources and the problems of ecology and the biosphere. They are due, in my opinion, to the fact that classical biology in essence has been forgotten. Everyone has become enthusiastic about gene engineering. This is useful and necessary. But now, when tasks connected with the study of the situation at Chernobyl have arisen for the Institute of Biophysics, it has turned out that we do not have radiation ecology. In essence, classical botany is also inadequately developed. It is possible with difficulty to find a botany specialist. We are talking a lot about pesticides. But do we know thoroughly enough when and where they should be used and how plants react to them? We have an inadequate knowledge of plant biology and entomology. A new stage of their development should begin within comprehensive studies, for example, biogeophysical studies or studies of the problems of the biosphere. For the accomplishment of these tasks it is also necessary to develop the appropriate organizational forms.

Corresponding Member of the USSR Academy of Sciences Ye.A. Radkevich

Somehow it is turning out, and not for the first time, that the earth sciences are not attracting proper attention of the Academy of Sciences. Now they are regarded not as basic sciences, now, on the contrary, they are accused for having little connection with practice. I believe that some misunderstanding of the significance of geology in all the diversity of its directions, starting with the ultra basic questions of the philosophy of the development of matter and ending with the purely practical tasks of the development of natural resources, exists.

At present it is impossible to speak either about the rapid development of machine building or about the development of industry, while leaving aside the sources of raw materials, which for the most part lie in the earth, be it metals or ceramics.

Finally, the problems of environmental protections are also problems of the protection of the earth. And that is why, in my opinion, one should not lose sight of such an important sphere of scientific activity as geology, with which many institutes in Siberia and the Far East are dealing.

Let me note, incidentally, that when in Moscow I am always amazed under what difficult working conditions the associates of central geological institutes work. They have probably gotten used to the cubicles that are separated by shelves. At one time there were plans of the construction of buildings for geological institutions, but they were never implemented.

The identification of the composition of ores is a peculiarity of the practical application of geology. Ores in our country are being consumed barbarously, a significant portion of the useful components is left in the mountain, in dumps, or in the waste of dressing mills. It was shown by works of the Far Eastern Geology Institute that at one of the large tin deposits of Khabarovsk Kray the value of the lost products is not less than the value of the basic metal—tin. Geologists have voiced their opinion, but then what? Then someone should develop a technology and build mills with new shops, but continuity from the geological to the practical conclusion is not arising. Departmental isolation is greatly complicating the work: each ministry is interested only in "its own component" of the deposit, while its other ingredients are lost.

Dumps and the waste of mining operations are one of the main sources of environmental pollution. For the present nothing is being done for their recovery and the development of waste-free production. The organization of a mining subdivision in the Earth Sciences Section of the Presidium of the USSR Academy of Sciences will perhaps contribute somehow to the comprehensive solution of these problems.

I want to direct attention to the fact that it is impossible to automatically apply the principle of material interest to scientific research work. For example, the performance of jobs, which yield an economic impact, is required of my colleagues at the Far Eastern Geology Institute. While attempting to approach practically the obtaining of important economic results, our colleagues

at times overstep the rules of ethics in the achievement of the set goals. Especially as mining and ore dressing combines, in obtaining the recommendations of geologist, issue reports on the impacts in millions of rubles. But about what impact is it possible to speak, if it will show only after decades? And mythical impacts, which both disorient economic organs of the country and in general harm the moral principles of scientists, are accumulating. Hence, such a principle of evaluating the labor of scientists is not justified, and the Presidium of the USSR Academy of Sciences should clarify this matter. Incidentally, the acquired achievements are not being tested by anyone. One must not allow the irresponsible payment of bonuses to oneself at academic institutions.

In connection with the establishment of the Far Eastern Department of the USSR Academy of Sciences the question of personnel is becoming urgent. Specialists do not stay too long at academic institutes of the Far East, because the conditions for normal existence do not exist. The scientists for the most part have been developed locally. The question of the further training of these personnel is essential. In particular, great difficulties arise in case of the consideration of doctoral dissertations, since the scientific councils, as a rule, are narrowly specialized, while discoveries usually originate at the meeting point of sciences. Great efforts are required so that the works, which develop new scientific directions, would be approved in the Higher Certification Commission as doctoral dissertations. The very rigid bureaucracy in the Higher Certification Commission is complicating the submitting of even candidate dissertations. It seems to me that all these questions require close consideration.

Corresponding Member of the USSR Academy of Sciences A.V. Yablokov

The question of the production of domestic pesticides was discussed in the interesting and brilliant report of Vice President of the USSR Academy of Sciences Yu.A. Ovchinnikov. The proposed solution of this problem seems debatable to me. In the report it was stated that it is necessary to expand the production of pesticides, since the state is spending much capital in purchasing them abroad. All this is so, but there is also another aspect of this question. At present it has been shown by a large number of studies that even the latest pesticides are very dangerous to nature and man. If the statistics of the morbidity, which is connected with pesticides, were well known, I believe, the majority of questions of their production and extensive dissemination would sound different. I cannot but support in this connection Academician T.I. Zaslavskaya, who in the press touched upon this aspect of the problem of environmental protection.[2]

I will cite several facts. In regions with intensive agriculture, where pesticides are used extensively, the development of children and adolescents is retarded and impaired. The level of congenital development defects is drastically increased in regions with the intensive chemicalization of farming, for example, in Moldavia.

The use of pesticides in the majority of developed countries is being moderated to a greater and greater degree, while its increase is characteristic only of poorly developed countries.

It is also well known that in our country there are farms, at which without the use of any pesticides and herbicides the yields are stable and higher than at neighboring farms, where chemicals are used.

Another aspect of the problem consists in the fact that in the United States the development of each new pesticide costs about $50 million. Of them an overwhelming portion of the assets is used for the checking of the biological action and impact on the environment, and not for the very process of synthesis, the cost of which comes to only a few percent of this amount. The most difficult thing is the system of checking. A high-quality system of checking is lacking in the Soviet Union, its development will cost the same tens of millions of rubles. The difficulties of checking consist not simply in the study of the means of the biological accumulation of pesticides in food chains, but in the explanation of the means of their biological transformation and in thepractically boundless number of versions of the interaction of the products of the decomposition of pesticides with other substances in the biosphere.

The establishment of the consequences of the action of pesticides on the genetic system of man is also extremely difficult. In my opinion, the cumulative long-term harm, which is done by pesticides to the health of man and the environment, exceeds the impact which agriculture obtains from the use of pesticides.

I will stress that questions of nature conservation and the making ofagriculture ecological, but not its chemicalization are raised at practically every meeting of the General Biology Department of the USSR Academy of Sciences.

It has been shown and acknowledged by many scientists that a strategically more correct means of developing agriculture is the changeover from one-crop to multiple-crop systems, which do not require at all any pesticides and herbicides. Precisely this means leads to making agriculture ecological.

At present strains of plants of increased resistance are being obtained by the methods of gene engineering. However, this resistance to diseases and parasites in cultivated strains passes very quickly, while the resistance of the suppressed forms increases. In just one decade—from 1970 to 1980—the total number of insects and arthropoda, which are resistant to any used pesticides, increased from 224 to 428 species, while now it apparently exceeds 500 species.

Unfortunately, the impression is being created that a lack of understanding by chemical scientists of the problems of general biology exists. For biology is not only physical chemical biology or gene engineering. Biology is living systems, which are incredibly more complex than chemical molecules, and very vulnerable systems.

A large number of unsolved problems exist in the development of general biology, they require the attention of the scientific community and await their solution.

Academician Yu.A. Osipyan

As is known, by order of the Presidium a commission, to which the work on the identification of elements of bureaucracy in the activity of the Presidium itself and its organs and on the elaboration of the corresponding measures was assigned, has been set up.

Flagrant cases of bureaucracy exist in our work and life, we have heard about them many times, in particular, V.L. Ginzburg repeatedly spoke on this at our assemblies. It is necessary to say that the members of the academy responded very actively to the request of the commission to them to report their suggestions and remarks, the commission received many letters. The cases cited in them are very impressive.

Here is one of many. When registering a trip abroad 11 copies of references are required. I believe everyone knows that here it is necessary to draw up tens of documents more. If, by moving along the chain, you got to the organs which make the decisions on a foreign trip, the staff members of these organs would say that they absolutely do not need such a number of documents. This is the excessive paperwork of the people who track the process of registration. Another example is the ban on making xerox copies of typed copies of articles that are being published. And there are many such absurd prohibitions, but it is very difficult to find their authors.

The combating of bureaucracy is a part of the restructuring which is under way in our society. The large detachment of employees in the state exists and is supported only by means of the bureaucratic machine, which creates absurd obstacles in the work and life of workers. V.I. Lenin always called for the combating of bureaucracy. In his collected works much attention is devoted to this.

Bureaucracy is, undoubtedly, a social phenomenon that requires a scientific approach for its comprehension, specialists in the field of the social sciences should deal with it. It is necessary to expose the nature of this phenomenon and to reveal the social vehicles of these tendencies. Then we will be able to combat it.

In what does the root of bureaucracy lie? In the replacement of the essence of a matter with its form. Let us turn to the activity of the Academy of Sciences. The development of basic research and its conducting at a leading level are the main element, the main duty of our work. We bear responsibility for this to society. But the existing system of evaluation of the work of our institutes is aimed not at all at this aspect of activity. We report back on everything we want to, just not on the level of work.

We fill out an enormous number of documents. A large number of specific examples of obstacles that are hindering work are cited in the letters of the members of the academy. It is also possible to hear about such cases from officials—the directors of scientific institutions. A huge number of artificially established regulations, which are harmful to the state and society, exist, but all the same state organs or specific people insist on their fulfillment. For example, one of the strict regulations is the division of staffs into administrative and nonadministrative personnel. In industry this has already been abolished, because the plants that produce output derive a profit and with this money maintain their entire staff and all their staff members. I believe that we should ask the management of the Presidium to appeal to the government and directive organs so that these regulations would also be abolished for the Academy of Sciences. They are entirely absurd.

In 1935, when the Institute of Physical Problems, which P.L. Kapitsa headed, was formed, a special decree of the Council of People's Commissars granted it specific rights, including the right not to divide the estimate into items and the personnel of the institute into administrative and nonadministrative personnel. This immediately provided an obvious staff saving. The chief of the personnel division at this small institute simultaneously performed the duties of an accountant, the librarian at the same time also work at another job. This was explained by judicious reasons.

I want to emphasize that one of the trends of the present development of society consists in the fact that the number of people, who work in the sphere of service, is continuously increasing as compared with those employed in production areas, and we are all perfectly aware of this. Why at institutes is the number of typists, accountants, and other low-paid positions regulated and is the board of directors forced to illegally reassign their work to people who receive 400 or 500 rubles a month? The scientific associate and the head of a laboratory should themselves type, because they cannot have a typist. It is necessary to change this abnormal situation.

The recent decisions, about which G.I. Marchuk told here, testify to the respect of the leadership of the country for us as members of the academy and to the aspiration to support our efficient activity. Is it really impossible not to entrust the directors of institutes and

the members of the academy with the settlement of such insignificant questions: How many and what kind of low-paid technical associates are there to be at an institute?

I want to dwell specially on the fact that above-standard stocks of materials ostensibly exist at the academy. I believe that this is also one of the displays of flagrant bureaucracy. There were, are, and can be no above-standard stocks at the Academy of Sciences. We should have as many materials as are required for efficient work and for the opportunity to quickly reorient ourselves in the necessary direction.

I will cite an example. In recent days we have been discussed very fervently the situation with high-temperature superconductivity. The situation in this area is now analogous to the prewar situation in nuclear physics, when every day brought some new result, when by telephone and in letters new data were reported and quantitative results were specified. Approximately the same thing is now happening in the field of high-temperature superconductivity. To our honor Soviet institutes very quickly, in a matter of days, joined in this work and obtained interesting results, and we are now at the appropriate scientific level. This was possible owing to the fact that in the situation, when every day some new substance was required, we were able to find it in the so-called above-standard stocks. But if they had not been available, it would have been necessary to act through the Central Supply Administration of the USSR Academy of sciences, the State Committee for Material and Technical Supply, and so on, and we would have lost several more months.

The question of how many and what materials academic institutes need in order to perform scientific work efficiently, is an example of toylike regulation, but meanwhile an enormous control and auditing staff, which checks whether institutes have exceeded the norm, say, of gauze or soap, is being maintained.

In order to combat bureaucracy effectively, it is necessary to simplify all regulation that hinders scientific work. Since more and more suggestions on how to make our work intelligent and purposeful are being received by the commission, on its behalf I ask the Presidium to hear systematically (once every few months or 6 months) the reports of the commission for the purpose of making specific decisions that should become mandatory for the staff of the Academy of Sciences.

One must not believe that elements of bureaucracy are observed only in the work of the staff and they do not exist among scientists. It is necessary to admit that the virus of bureaucracy has infected us very strongly. We have been living a long time in an atmosphere of the need to report back with respect to formal attributes, and not with respect to the essence. For example, comprehensive checks of institutes are made systematically. And I believe that it is entirely safe to saythat these checks are not achieving their goal, that they are also an example of a formal attitude toward work. At best the wishes about what an institute needs to receive from management are recorded in acts. And the only type of criticism consists in the fact that at an institute there are not enough computers or facilities or the number of personnel is insufficient.

Now, when substantial changes are occurring at the Academy of Sciences, when all the rights on the supervision of institutes are being delegated to the departments, we should treat the matter with greater responsibility. Within the framework of the opportunities, which are being granted the departments, we should manage in a practical manner all assets and all staff resources.

In this connection I would like to say that our scientific community is anxious regarding the fact that the process of transferring organizational functions to the departments is encountering some resistance. It is necessary that this process would take place completely, half-hearted steps will be ineffective. Therefore, the Presidium needs to track systematically the progress of restructuring and to see to it that the departments would acquire real rights.

In conclusion, while completely agreeing with what P.G. Kostyuk said here, I want to stress that at the Academy of Sciences all basic research should be conducted at the highest, world level. There should not be other research (as the hero of Bulgakov said, the sturgeon is only the freshest). Many manpower and material resources are being spent on the repetition of already conducted research and on work which does not conform to the world level. We lack both instruments and computer hardware, because the Academy of Sciences has grown extraordinarily and is performing on a large scale work that sectorial institutes should conduct.

[Editorial note] The statements, which could not be heard by the assembly due to the lack of time, are published below.

Academician S.V. Vonsovskiy

The USSR Academy of Sciences is responsible for the solution of the most diverse problems of science, technology, economics, and culture of our country. In this connection I want to direct attention to one problem of a global nature, which has not yet been mentioned at the General Assembly. This is the problem of the North of our state, which includes the socioeconomic and ecological aspects. Northern oblasts, which, in particular, are located in the permafrost zone, make up more than half of the total area of the country. However, these regions are not at all deserted, on the contrary, this is a storehouse of the most valuable minerals and other gifts of nature. Suffice it to recall the reserves of petroleum and gas in the northern part of Western Siberian and the shelf of the North Arctic Ocean. My work in the Scientific

Council of the State Committee for Science and Technology for the problem of machines and materials, which meet the requirements of operation in various climatic zones of the country (it is mainly a question of the North), and in the Standing Commission for Science and Technology of the RSFSR Supreme Soviet has closely linked me with the problems of the North.

Several years ago a scientific expedition, which traversed the entire coast of the North Arctic Ocean from the Bering Strait to Murmansk, in practice under the conditions of polar night, was organized on the initiative of the All-Union Komsomol Central Committee, the editorial board of the CPSU Central Committee newspaper *Sovetskaya Rossiya*, and the Presidium of the Ural Scientific Center of the USSR Academy of Sciences. The expedition gathered extremely comprehensive and very valuable materials on all aspects of the life, economy, and natural conditions of the Far North. One of the main conclusions, which was drawn by the commission as a result of analyzing these materials, is the establishment of trouble in the life of all our North. For the most part it is dictated by departmental interests and the total lack of any coordination among them, which is having an especially unhealthy effect on the ecology of the fragile nature of the North. On the basis of the detailed discussion of the materials of the expedition the commission appealed to the Presidium of the RSFSR Supreme Soviet with regard to the most urgent problems of the northern region, but so far no decree has been adopted. During the prewar years a single organization—the Main Administration of the Northern Sea Route—operated in the North, but at present its functions have been reduced to the management proper of the sea route.

How are things going in the other countries that have northern territories? In Europe, besides the USSR, there are five northern countries: Finland, Sweden, Norway, Iceland, and Denmark (with its province in the north—Greenland). However, their territories are negligible as compared with the Soviet North and for this reason are easily managed. The conditions in North America—in Canada and the state of Alaska in the United States—are more similar to our situation. In Canada, for example, a special ministry completely monitors and coordinates all economic and other activity on the territory of the Canadian north. Not having a unified administration that coordinates all the problems of the Soviet North, we are in an extremely difficult position. Although the northern territories belong only to the RSFSR, 42 union ministries, which are not subordinate to the RSFSR Government, supervise economic activity in the RSFSR North. And here first of all the fragile nature of the North is suffering, for each individual department, in accomplishing its important state tasks, as a rule, does not direct attention, for example, to the questions of the ecology of this region. The interests of the nationalities of the North with their unique culture and complex economy under the conditions of a harsh climate often are also not given any attention. As an example it is possible to indicate that in the North in practice its own specialized journals are not published, while capitalist Alaska has more than 40 specialized periodicals.

In our country the journal *Severnyye Prostory* was organized 2 years ago. However, it reflects only agrarian issues and is published as an appendix to the journal *Selskaya Nov*. Here the suggestion of the Commission for Science and Technology of the RSFSR Supreme Soviet on the establishment of a common press organ for the North, which would be free of the pursuit of narrow departmental interests, has been ignored.

At present on the initiative of Corresponding Member of the USSR Academy of Sciences Yu.A. Izrael, head of the State Committee for Hydrometeorology and Environmental Control, steps on establishing order in our northern region have been taken through the USSR Council of Ministers. It is obvious that the USSR Academy of Sciences also needs to include in the plan of its scientific organizational activity a global problem—"The USSR North." As the first step it would be advisable to examine this problem at one of the next meetings of the Presidium of the USSR Academy of Sciences with the participation of the USSR State Committee for Hydrometeorology and Environmental Control, the RSFSR Supreme Soviet, and the RSFSR Council of Ministers, as well as the USSR State Planning Committee.

Corresponding Member of the USSR Academy of Sciences F.E. Reymers

In my statement I want to dwell on the problems of the publication of popular scientific literature at the Nauka Publishing House. It has to be stated that reliable methods of determining the number of copies of both popular scientific books and scientific publications are lacking, as a result of which the numbers of copies are established arbitrarily and many good popular books are published in a negligible quantity. The books of the popular series, as a rule, are written in uninteresting, office language, do not have a clear reader "address," and are designed worse than at other publishing houses. Often simply scientific monographs also get into this series.

In my opinion, it is the duty of the real scientist to write popular books. The notion that special talent is needed for popularization is incorrect. Only culture, much labor, and a belief in the necessity of the matter are needed. For through popular publications the results of scientific achievements are spread to the broadest circles of readers. A good popular book, which relates the successes of Soviet science, increases the prestige of the Academy of Sciences. Therefore, I believe that at the Nauka Publishing House the attitude toward such publications should be changed radically: the best editors, the best makeup, and the best quality of paper for the popular book. This is a book for the people, and it should attract the reader. I propose to prepare for publication a series of popular books in all fields of knowledge, which is devoted to the 70th anniversary of October, under the general motto

"The USSR Academy of Sciences for the People." My last remark concerns the need to preserve archives of published books for a long period, for which it is necessary to have the necessary warehouse facilities. In case of the attempt to republish the popular book of Corresponding Member of the USSR Academy of Sciences F.P. Krendelev abroad it was discovered that at the Siberian Department of the Nauka Publishing House all the archive materials of this book had been destroyed due to the lack of storage space.

Academician Yu.M. Pushcharovskiy

It seems to me that we should no longer specially emphasize the importance of basic research. We convinced each other of this long ago, and the scientific community, except for bigoted individuals, has no doubts on this account.

I would like to touch upon the question of the interaction of the sciences for the further development of the most important sections of the natural sciences. I will illustrate this on the basis of the example of the earth sciences. In order to arrive at a general theory of the structure and development of the earth, and this task has become especially important in the last quarter of the 20th century, geology alone is insufficient. There is no means of gaining knowledge of the process of accretion of terrestrial matter and the causes of the formation of its radial and lateral heterogeneity without the enlistment of the latest data of space chemistry and cosmology. Here it is hardly possible to abstract oneself from the explosion of a supernova, that is, from astrophysics. Moreover, the observations of quasars by the method of superlong base-line radio interferometry make it possible to determine the velocities of motion of various points on the surface of the earth, without which it is impossible to approach a global geotectonic concept that is anyway close to reality. Alas, in our country such measurements are not being made either by the method of radio interferometry or by the method of laser reflections off satellites (this is a physical technical area), which is complicating excessively the attainment of the level of advanced geological theory.

Incidentally, it is necessary to note that foreign data by no means always confirm the tectonics of lithospheric plates. It turns out that within one plate the points move with different velocities and along different vectors. By the way, there are also many other inconsistencies, which do not make it possible to regard plate tectonics as more than a working hypothesis. However, there can be no doubts that horizontal motions play a most important role in the structural development of the earth. The Geology Institute of the USSR Academy of Sciences is developing its own concept of the differentiated horizontal displacement of the deep and near-surface plates of earth masses of different thickness, which explains many geological phenomena. The concept includes, of course, both continental drift and the formation of secondary oceans.

The closer interaction of such "related" disciplines as geology, geophysics, and geochemistry is also necessary for the progress of the natural sciences. Geology and geochemistry are encountering at every step substantive inhomogeneities in the structure of the planet. But how did these inhomogeneities form and what is their geodynamic role? For an answer it is necessary to go far into the depths of the earth, to the core. How does it behave? Does it not transmit unevenly distributed pulses to the enveloping geosphere, while the latter in turn transmits them to an even higher shell, and so on? Does not chaotic motion which is due to convective phenomena of a different scale and a different level, occur as a result? Seismic tomography, which is capable of revealing the heterogeneous structure of even the core of the earth, can help in solving all these problems.

I mentioned all these subjects in order to attract to them the close attention of scientists of the Physical Technical and Mathematical Sciences Section of the academy. Very major discoveries would be a consequence of their vigorous assistance to geologists.

Further, in connection with the fact that the evolution of geological processes was discussed at the General Assembly of the USSR Academy of Sciences, I would like to stress the urgent need to study the abrupt changes, catastrophic phenomena, and "revolutions" in geological history, to which not only paleogeological, paleoclimatic, and tectonic structures, but also sudden changes of the organic world and geochemical anomalies in sedimentary series point. The earth is not a body that is insulated from external actions, on the contrary, it is constantly subject to their influence. Science is just beginning the deciphering of these external actions. New ideas, which are very necessary, in particular, for the philosophy of the natural sciences, also await us here.

Finally, taking into account the basic trends of development of world and domestic geology, as the main direction of geological research at the USSR Academy of Sciences in the next few decades it is possible to name the origin, structure, and development of the shells of the earth, as well as new sources of minerals.

Corresponding Member of the USSR Academy of Sciences N.N. Dikov

I will dwell briefly first on the development of the social sciences in the Far Northeast of the USSR, that is, in the northern part of the Far East, and then on the general methodological questions which are connected with the stimulation of the human factor and with culture.

The necessity of the rapid and effective development of the social sciences, particularly the historical sciences, is now universally recognized. This is also of great importance for the Far East. For in the development of the international situation the role of the Asian-Pacific Ocean region of the world will increase more and more. General Secretary of the CPSU Central Committee M.S.

Gorbachev spoke about this in his speech at the festive meeting on 28 July 1986, which was devoted to the presentation of the Order of Lenin to Vladivostok. Academician I.I. Mints and Corresponding Member of the USSR Academy of Sciences A.I. Krushanov then stressed this fact at the December (1986) conference of social scientists. The field session of the Presidium of the USSR Academy of Sciences in Vladivostok was a big step forward in the matter of the development of science, particularly the social sciences, in the Soviet Far East.

It is a pleasure to note that in Magadan—the main scientific center of the Northeast of the USSR and the administrative center of the rapidly developing mining industry field—a place was found for archeologists, historians, and ethnographers. The combined laboratory, which unites them, is a structural subdivision of the Northeastern Complex Scientific Research Institute of the Far Eastern Scientific Center (now the Far Eastern Department), which was organized in 1960 by Academician N.A. Shilo. In 1986 A.A. Sidorov became director of the Northeastern Complex Scientific Research Institute. The efficiency of the work of this laboratory, which is small in size, is quite high, which in many respects is explained by the support on the part of the board of directors of the institute and the party leadership of the oblast.

The problems of the laboratory, which are united by the comprehensive theme "The History of the Northeast of the USSR From the Most Ancient Times to Our Days," are of far from a local and regional nature and, therefore, perhaps, merit attention when singling out the priority directions of research. The historical experience, which we are studying, of the so-called noncapitalist development of the peoples of the Northeast (the Chukchi, Koryaks, Evens, Eskimos and others) from a primitive communal system to socialism is useful for developing countries. The problems of the sociohistorical development of the Northeast of our country are reflected in a number of publications, particularly "Ocherki istorii Chukotki" [Essays on the History of Chukot Peninsula] (1974). The fact that a large place name dictionary of the Northeast of the USSR has been prepared for publication by laboratory associate V.L. Leontyev (jointly with K.V. Novikova), will probably interest linguists.

The results of our archeological research, especially on the question of the original development by man of the cold and bleak Northeast, and from there also America, and on Beringia, which was flooded 10,000 years ago, are also attracting the attention of Soviet and foreign scientists. With respect to the problem of the original settlement of America lively scientific relations are being developed here with archeologists and anthropologists of the United States, Canada, Great Britain, the FRG, Japan, Venezuela, Cuba, Mexico, France, Italy, and other countries. We annually conduct archeological surveying and digs on the Kamchatka and Chukot peninsulas—in the immediate vicinity of America. And it is necessary to continue this research, which is of international importance, in order not to fall if only behind the explorations which are being carried out in Alaska, not to mention the other coastal western states of the United States, where archeological exploration assumed long ago an extensive scope.

Let us proceed now to the second question. You will agree that if we attach great importance to the human factor in the acceleration of our socioeconomic development, it is necessary already now to reconsider as well our attitude toward the cultural revolution. In my opinion, it is still far from over, although many historians and philosophers believe that it fulfilled its tasks by 1937 (when socialism triumphed for the most part) or is being completed at the present stage of development of our society—at the stage of mature socialism.

It is possible to consider that only the initial stages of the cultural revolution have been successfully completed, and although the achievements here are enormous and indisputable, the main task of the cultural revolution—the formation of a comprehensively developed and integral individual—is still far from being accomplished.

In this respect there are still enormous possibilities, on the indispensable condition that the cultural revolution will be filled with a new content, including now not only public education, cultural educational work, health care, science, and art, but also to an ever greater degree moral cultural, which is permeated with democratism and humanity, and the culture of intercourse, trade and personal service, national relations, and so on, which excludes bureaucracy.

The more thoroughly and comprehensively the cultural revolution is filled with this new content, the more active and effective the role and significance of the human factor will be in the acceleration of socioeconomic development and in the improvement and restructuring of our society—the first phase of communism, and the sooner its second phase will approach. It is quite obvious that the understanding of the cultural revolution as an essential aspect of the first phase of communism is of great practical importance at the present stage of development of socialism. However, this question still requires in-depth study, extensive discussion is desirable here.

Academician A.M. Rumyantsev

In the very interesting, in my opinion, report of Vice President of the Academy of Sciences Academician Vladimir Aleksandrovich Kotelnikov for the first time in the history of our assemblies the social sciences were named in first place, it was stated that all scientists need to heed the conclusions of the social sciences. But it seems to me that first of all it is necessary to pose a task for the social sciences themselves: they should reveal with all scientific responsibility the causes of the situation, in which our country was prior to 1985.

In the press such words as "revolutionary changes," "restructuring," even "revolution," "acceleration," and "new thinking" are now widespread. I believe that the social sciences first of all should reveal the meaning of these words and the reason for their appearance. In my opinion, the need for their appearance is due, in essence, to the distortions, which were the result of the "big" cult and the "little cults" that followed it. At that time glasnost, criticism, and modesty retreated, at that time libertarianism, administrative license, and conceit appeared. In the past 20-year period prior to the April (1985) CPSU Central Committee Plenum the economic development of the country took the extensive path. The gained heights in the growth of labor productivity in the pace of development, and in social relations were lost. Various forms of mass deception appeared, embezzlement, bribery, extortion, speculation, and similar antisocialist phenomena followed. In management bureaucracy developed to an ever greater degree. There are needed for its elimination a high level of education, to a man, as V.I. Lenin said, of the entire population, the "one and all high" level of culture, and the "one and all participation" of all the people in the monitoring and in the discussion of the entire social life of society, which also imply the active participation of everyone in management, when no one will take anything on faith, when no one will act against their conscience, as V.I. Lenin specified when forming the workers' and peasants' inspection.

Today in the level of political consciousness and in the level of intellectual development the masses of people of our country have risen to an understanding of the shortcomings, the difficulties, and the obstacles, which have emerged in the way of the building of socialism. The critical attitude toward the situation, which the party is now mobilizing for the revolutionary overcoming of all the named shortcomings that are hindering the realization of the advantages of socialism, has emerged among the masses.

The April (1985) CPSU Central Committee Plenum, the 27th party congress, and the subsequent plenums expressed this need and appealed to all of us for the revolutionary implementation of changes, the surmounting of the emerged distortions, about which our press is now talking extensively, and the implementation of the democracy, which is inseparably connected with the essence of socialism and with the essence of the method of building socialism, which Lenin called democratic centralism in the economy. Precisely democratic centralism, for centralism is objectively necessary for the management of a modern socialized economy, and being established not from above, but from below, and being understood and voluntarily realized by the masses themselves, it becomes most democratic.

In this connection I would also like to speak about the opportunities that are being afforded the Academy of Sciences, namely the opportunities to help in the extradepartmental discussion of the plans and measures being formulated with allowance made for the highest achievements of science and technologies and the needs and possibilities of the masses themselves.

It seems to me that it should think over this question well and act as such an extradepartmental expert center.

It would have been a good idea if in the tasks, which were posed by V.A. Kotelnikov for all the departments of our academy, the questions of the analysis of the circumstances and the causes of the formed situation had found a place.

I will not dwell further on these questions, for they require special consideration, and will proceed to the everyday trifles of the life of our academy.

I would like to direct attention to the need to ensure a nigh capacity for work of all the scientific personnel of the Academy of Sciences. This also presumes the intelligent organization of relaxation and treatment. At the same time in this area we continue to lag exceedingly, for example, behind the 4th Main Administration of the USSR Ministry of Health with respect to the organization of medical institutions, the supply of drugs, and the use of the most highly skilled medical forces.

In particular, I would like to direct attention to the situation of such, I will risk saying, a favorite academic corner of relaxation and treatment as the Uzkoye Sanatorium. In spite of the fact that it located within Moscow, in its microclimate it remains the former Uzkoye Sanatorium.

But the state of affairs at the Uzkoye Sanatorium (which in addition is now not a clinical sanatorium), to put it mildly, is poor both from the standpoint of medical possibilities and from the standpoint of cultural recreation. At the same time the Uzkoye Sanatorium is also a historical architectural monument, a monument of the attention of the then young Soviet state to the provision of the best conditions for the work and relaxation of the scientists of our country.

I would ask the Presidium of the Academy of Sciences to direct special attention to this question.

Footnotes

1. The continuation of the publication of the materials of the Annual General Assembly of the USSR Academy of Sciences of 10-12 March 1987. See the beginning: *Vestnik Akademii Nauk SSSR*, No 7, 1987.

2. *Pravda*, 6 February 1987.

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Bureau of Economics Department Discusses Production Quality

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[Article by Candidate of Economic Sciences L.A. Anosova under the rubric "In the Departments of the USSR Academy of Sciences": "Economic and Organizational Problems of the Increase of Product Quality"]

[Text] The problems of quality are today of not so much a technical as an organizational and economic nature, and academic economists, whose work is not subordinate to narrow departmental interests, are called upon to play a large role in their solution. However, a unit, which would deal specially with the entire set of these diverse problems and would be capable of making an "inventory" of the available scientific reserve, of identifying the most important problems, and of outlining the prospects of research, does not exist either in the Economics Department of the USSR Academy of Sciences or in the entire system of scientific economics institutions of the country. They attempted to fill this gap in part, having gathered at an expanded meeting of the bureau of the department specialists from various scientific institutions and state departments, which are involved with various aspects of the problem of product quality. Their statements as a whole gave a quite complete picture of the state of affairs, which is capable of serving as a starting point for further work.

Strictly speaking, the Bureau of the Economics Department is addressing the questions of the quality of labor and products not for the first time. Precisely at a similar meeting of the bureau 8 years ago the applicability of the general theory of control to such a complex object as quality was substantiated, the most important principles of the comprehensive approach to the increase of product quality—the conceptual basis for the development of all quality control systems at enterprises and associations—were formulated. Specialists, A.V. Glichev, director of the All-Union Institute of Metrology and Standardization of the USSR State Committee for Standards, noted, to this day remember this with gratitude. Since that time, according to the data of the State Committee for Standards, nearly 32,000 such systems, which are based on the principles formulated at that time, have been established. And wherever these systems are actually operating, product quality is quite high. Unfortunately, for the present there are not too many such operating systems—not more than a third of all the registered systems. The remainder are of a quite formal nature. This, too, is not convincing. For thus far enterprises have not had real stimuli for the practical application of these effective principles. There are also no personnel, who could at the necessary level check quality and work on its increase: such specialists are not being trained at any educational institutions, while it is naive to rely on the effect of 2- to 3-month courses of the improvement of skills.

G.A. Vlaskin (the Institute of Economics of the World Socialist System of the USSR Academy of Sciences) cited interesting data which characterized the work of various units of production and organs of technical control. According to information of the State Committee for Supervision of Safe Working Practices in Industry and for Mine Supervision, in recent years 20 percent of the breakdowns of equipment occurred due to deviations from the dimensions specified in drawings, 40 percent—due to assembly defects, 10 percent—due to welding defects, 13 percent—due to heat treatment defects, 4 percent—due to painting defects, and about 13 percent—due to design imperfections. But the combating of defects is not the only and, perhaps, even not the main one of the problems of product quality. It is possible to prevent such violations, in particular, by having made control more strict, which is also being done today, following the decisions on the changeover to state product acceptance. It is more difficult to achieve another thing.

Research shows: the rate of product obsolescence doubles every 20 years. But the most stringent control is insufficient for the constant updating of products: the producer himself, who is urged on by inevitably working economic mechanisms, and not by pressure "from above," should be interested in such updating. Already today such pressure is incapable of forcing the producer to act contrary to his interests, and the greater his, the producer's, independence is and the more rights cost accounting gives him, the less effective outside coercion will be. Only the entire economic mechanism as a whole can coordinate the interests of the producer with the requirements of scientific and technical progress.

The Shortcomings of the Economic Mechanism Are the Main Obstacle of the Improvement of Products

In the opinion of the majority of discussion participants, the defects of the pricing system affect product quality most severely of all. Moreover, here, as A.Sh. Akhmeduyev (the Institute of Economics of the USSR Academy of Sciences) stressed, even the large-scale economic experiment did not improve the situation in any way: neither the functions of prices nor the principles of pricing changed in practice during the experiment. True, the prices for several types of goods began to be determined in accordance with a direct understanding of the producer with the client, but there are too few such products.

But it is a matter not even of quantity: it is necessary, many discussion participants stressed, to put an end to the formal nature of pricing and to link prices with the requirements of the consumer. A.A. Deryabin (the Institute of Economics of the USSR Academy of Sciences),

who presented at the meeting the most detailed concept of the reform of pricing, asserts: the system of prices can promote scientific and technical progress only if we reject several fixed assumptions, which have already had time to some extent to acquire the force of axioms.

One such axiom is the necessity to determine the price for a new product on the basis of the price for a similar product, which was assimilated earlier, with a markup for the increase of production costs and the "effective impact" of the new item. As the analysis shows, such a procedure of determining prices directly forces the producer to overstate by every means the estimated economic efficiency of the new product. And although pricing organs subsequently reduce by 30-50 percent the optimistic estimates of the producers, the thus adjusted amount of the estimated efficiency all the same, as practical experience shows, remains greatly overstated. Under real production conditions the efficiency of new equipment, as a rule, is much lower than that, from which they proceeded when setting the price.

The prevailing procedure of determining prices not by chance leads to such adverse consequences for practice—it is theoretically unjustifiable. For it is necessary to compare the real ratio of the socially necessary expenditures of labor on the production of the old and new product in a different way: it is determined not by the conditions of the production of a given type of product, but by the more general conditions of reproduction. This means that the socially necessary expenditures of labor themselves on the production of the old product automatically change with the appearance of a new, less expensive, or more efficient product. Precisely the cost of this new product also begins to determine the cost of old items—this latter with the appearance of a less expensive or more efficient substitute automatically decreases. An old machine, according to the expression of K. Marx, loses exchange value as machines of the same design begin to be reproduced less expensively or better machines come into competition with it.

Thus, in full conformity with political economic theory not the markups on the prices of a new product, but the automatic depreciation of any product—parts, assemblies, units, machines, and so forth—in which new design or technological solutions that have emerged are not used, should be the main economic stimulus for the assimilation of a new product. Such a decrease would exceed by several fold the possible increase in some cases of the prices for the new product. But if not the "advance" due to the economic impact of this product for the consumer, which is anticipated in the future, but the real decrease, which is simultaneous with the incentive, of the monetary revenues of those, who do not use the achievements of scientific and technical progress, is the source of assets for the incentive of the producers and developers of the new product, then any enterprise will be vitally interested not simply in the use of these achievements, but also in using them as quickly as possible, having gotten a jump on other enterprises and, what is the main thing, not having let them get a jump on itself.

This would also make easier the position of the organs of planned pricing. Today they are inevitably subject to criticism and complaints from all parties. If the requirements of the producer are met, the consumer is dissatisfied. If the price is acceptable for the consumer, the producer is dissatisfied. But most often both are dissatisfied. Moreover, today precisely those, who does at least something for the increase of product quality, also come into conflict with pricing organs—it is impossible to offset their additional costs by higher prices. But since any decision on the level of the price or markup comes from some specific person, it inevitably takes on a shade of subjectivism.

The position of pricing organs would improve significantly, if not some specific specialist from pricing organs, but the automatic effect of scientific and technical progress and the appearance of high-quality types of new products acted as the "perpetrator" of the decrease of prices for obsolete products. This would introduce in the economic mechanism an element of economic competitiveness, which it so needs, including between enterprises which belong to different sectors. Only those, who use more quickly and efficiently than others the achievements of scientific and technical progress, would stand to gain.

Such pricing techniques make it possible to interest the producer not only in the quick assimilation of new items, but also in the maintenance and gradual increase of the established technical and economic parameters and consumer properties of all produced items without exception. Today the connection between prices and quality—in the sense of conformity to the standards and specifications—takes the form of the difference of prices for commodities of different grades. But more often this connection is only nominal. Suffice it to compare commodities of the same purpose, which are produced by different enterprises. Thus, the population today obviously prefers to purchase ZIL and Minsk refrigerators, while many other refrigerators of the same class enjoy an extremely low reputation, and the trade network is literally flooded with them. The differences in the quality of clocks, televisions, and many other items are just as great. However, the prices for these commodities do not depend on the real quality and demand for them and are determined only by formal technical parameters—in the case with the refrigerator, for example, by the capacity of the compartment.

Moreover, the ratio of the wholesale prices, which merely create the real interest of producers, is often inverse to the quality—the wholesale price of one of the best domestic refrigerators, the ZIL, remains relatively the lowest.

The shortcomings of this sort in the pricing of means of production are less noticeable, but even more striking. With respect to the majority of machines, instruments, and equipment the prices are actually not linked in any way to any specific indicators—if only the declared indicators.

Under present conditions it probably makes sense to agree to the "firm" differentiation of the wholesale and retail prices for consumer goods and the wholesale prices for means of production—to establish 15- to 20-percent markups on the prices for products of those enterprises and associations, which have a greater reputation and support it by the production of higher quality products, and discounts for the products of enterprises, which are known for defects, low quality, and the unreliability of their items, while increasing or decreasing accordingly the amount of the material stimulation fund. Moreover, if a "firm" markup on prices is established for some enterprise, the "firm" discounts on the wholesale prices should also be established at the same time and in the same amount. The revision of the markups and discounts once every year or 2 years will create adequate stimuli for the increase of quality and will introduce an element of competitiveness in this area. The evaluation of quality should be obtained, first, from consumers and, second, from competitors. Together with the application for a markup they should indicate those, whose product in quality is inferior to their product and who, accordingly, should receive a discount on the wholesale price by this amount. In such a situation the role of arbiter for the most part will be retained for pricing organs.

However, given the present relations between the producer and the consumer no change of the procedure of pricing in itself will yet solve the problems of quality. In order for prices to properly become a powerful lever, both the producer and the consumer should be more highly interested in "counting money." For the present even in those relatively rare instances, when the consumer can influence prices, he far from always tries to avail himself of this opportunity. In confirmation of this L.I. Rozenova (the USSR State Committee on Prices) cited just one, but a very eloquent example. Recently the State Committee on Prices as a "self-inspection" decided to check the correctness of the markups on prices, which had been established for a number of items for increased quality. The check was made directly at enterprises, where this new equipment was being used.

It turned out that of a batch of 54 presses, which had received such markups, not one was operating due to design imperfections. However, none of those who purchased these presses demanded that the paid money be returned, as was stipulated by the delivery contract. Obviously, one must not simply declare the rights of the consumer—the appropriate economic mechanism is necessary for their realization.

And here they see the main misfortune in the preservation of the procedure of planning "from what has been achieved," "from production," and not from needs. Hence, P.Ye. Belenkiy (the Lvov Department of the Institute of Economics of the Ukrainian SSR Academy of Sciences) believes, the inadequate orientation of planning toward the end national economic results of production and physical indicators, the imbalance of plans with respect to needs-possibilities and quality.

Precisely the plan, as the main regulator of production relations, has a substantial influence on all other regulators, particularly the price. The prevailing theory and practice of planning "from production" also gave rise to the corresponding theory and practice of pricing. The price in case of such an approach is called upon to stimulate first of all the producer and to regulate first of all his economic activity. The influence of the price on other spheres of reproduction in this case is hardly taken into account. Due to this a significant portion of the new equipment is not being used: excessively high prices limit its efficiency. The further increase of prices, by stimulating the producer in a one-sided manner, weakens the link between production and consumption.

Goal program planning and management, which are carried out on the basis of physical indicators, make it possible to orient production toward the end result. It is impossible to change over to such planning without having revised several theoretical concepts and without having implemented a number of practical steps. But in order to stimulate not only the production, but also the use of new, high-quality equipment, it is necessary, first, to ensure the growth of the savings of enterprises and sectors—a potential source of investments, second, to increase the standard (proportion) of the profit, which is left at the disposal of enterprises for the retooling of production, and, third, to differentiate the fee for capital, having significantly increased the fee for obsolete capital.

Operating cost accounting enterprises should be changed over to full self-support [samookupayemost], to real, that is full, cost accounting. But for this it is first necessary to consolidate them: it is possible to exercise cost accounting rights only in large sectorial and intersectorial complexes with their own scientific research institutes and pilot production, which have been brought close to finished-product manufacturing cycles—balanced comprehensive goal program planning and management at all stages are possible only there.

The need "to use more completely commodity-money relations," which is formulated in the new version of the CPSU Program, also requires the corresponding changes in the system of the evaluation and stimulation of the economic activity of the enterprise. One should change over from the differentiated evaluation according to the quantity (the fulfillment of the plan, deliveries, and so forth) and quality to a unified integrated evaluation according to the output of products with allowance made for their quality. Quality should have a substantial influence on the amount of derived profit.

The procedure of deducting assets for each of its funds subject to certain "fund-forming indicators" is also at variance with the broadening of the economic independence of enterprises. The entire profit of a truly independent enterprise, which is left after the standardized deduction of assets for the state budget and the centralized sectorial fund and the payment for credits, should go into its funds. This profit should be broken down among the various funds of the enterprise in conformity with approximate standards, which are differentiated by sectors and groups and are regularly adjusted subject to the specific tasks of retooling, social development, and so forth. In case of planning "from what has been achieved," D.S. Lvov (the Central Institute of Economics and Mathematics of the USSR Academy of Sciences) stressed, one of the main advantages of a planned economy is not being used—the possibility of determining centrally what kind of equipment we need and what the maximum state allocations for its development can be. Due to precisely such a procedure of planning the main parameters, which would determine technical policy, have thus far not been established in our country.

And even under the conditions of the economic experiment, A.B. Gorodetskiy (the Institute of Economics of the USSR Academy of Sciences) stated, pricing remained cut off from the unified science and technology policy and from the cost accounting of production associations. While given such a procedure there is also not much benefit from various kinds of "limiters" and "ceilings," which are called upon to check the growth of prices. They only formally make more strict the process of determining prices, but do not streamline it and do not increase its effectiveness.

Not only production, but the amount of the wage and material stimulation funds are planned "from what has been achieved." And, N.A. Smirnov (the Institute of Economics of the USSR Academy of Sciences) believes, the main obstacle to the stimulation of work on product quality lies in this. In case of any form of material stimulation it is necessary to compare the real indicators of the collective not with the "achieved" indicators—the plan assignments and indicators during the preceding period, but with the level of the indicators of other similar enterprises and associations. This principle presumes the use of common group and sectorial standards of the formation of the wage fund and the economic stimulation fund. The stimulation of quality is a component of the work on the assurance of highly efficient end results of the activity of cost accounting enterprises. The mechanism of stimulation for quality and of the increase of responsibility for it should fundamentally blend with the system of full cost accounting, when the entire fund of the remuneration of labor at enterprises is formed in accordance with a unified economic standard, which is common for all payments and is linked with the level of the indicator of the end cost accounting results of work. On the other hand, planning "from needs" and the stimulation of the end result presume the much greater freedom of the enterprise in the use of this fund. Thus, within its limits the enterprise should have the opportunity not only to introduce a supplementary payment for individual leading workers, but also within specific limits to increase the rates and salaries for the entire collective.

The Problems of the Evaluation of the Quality and the Certification of Products

Anyone, who if only in some way is connected with the problems of product quality, cannot but direct attention to another paradoxical fact: the complaints about product quality at the least are not decreasing, while the number and proportion of items, which receive the highest quality category, the State Emblem of Quality, and so forth, are steadily increasing. Many meeting participants also directed attention to this paradox. A.A. Deryabin, for example, noted that in 1984 of the 300 descriptions of machines, instruments, and types of equipment, which had been grouped by the commission of the State Committee for Science and Technology with ones that are obsolete and are to be removed from production, 165 had the highest quality category. This oddity is explained by the imperfection of the system of the evaluation of the quality and the certification of products. Moreover, this is a most complex bureaucratic process: for the certification of just 1 item it is necessary to prepare 46 documents with a total of 330-350 pages, to spend 3-4 months, and to enlist tens of people. And here it is not ruled out that the result of certification will become obsolete precisely when they award the product the highest quality.

True, scientists see in different ways the means of improving certification. A.A. Deryabin himself in his very detailed report did not dwell at all on this problem. The procedure proposed by him of automatically decreasing the prices for an old product after the appearance of a more advanced product in a certain sense replaces formal certification. Other specialists are seeking an opportunity to improve the methodology and procedure of certification. Thus, V.V. Kochetkov (the Scientific Research Institute of Technology of Machine Building) sees the basic shortcoming of the present methodology in the fundamental incomparability of the two used criteria—the value characteristics and the scientific and technical level and the methods of evaluation, which correspond to them—the economic estimate and the expert evaluation. Moreover, today, in order to make an evaluation of the efficiency and quality of a new item, it is necessary to compare the item being evaluated with analogs with respect to 50-60 value and technical indicators. But the information on corresponding foreign developments is very incomplete and, moreover, lags greatly, and the sets of domestic and foreign indicators, which are used for the estimate, do not coincide. All this leads to the overstatement of the evaluation of the item being certified, which is being compared with the obsolete data of foreign developments in accordance with incomplete and ambiguously interpreted information.

P.Ye. Belenkiy also believes that due to the orientation toward foreign analogs as the base for comparison the product being developed may already become obsolete at the stage of the preparation of production. Due to this, in particular, up to 40 percent of the items being newly developed are certified as being of not the highest, but the first quality category.

The standards of the updating of products, which were introduced starting in 1986, in themselves will also not solve the problems of increasing the technical level and quality of products: they do not take into account the acceleration of scientific and technical progress and, accordingly, the rapid shortening of the time of obsolescence of items. All these shortcomings appear already at the stage of designing. The technical parameters of the systems being developed are selected on the basis of the forecasting values of only individual isolated characteristics, which are not connected by a generalizing functional dependence. Due to this designing thus far has not been oriented enough toward economic criteria, although the economic efficiency of new equipment first of all depends precisely on design solutions.

A new product will satisfy the requirements of the highest quality category only when not the indicators of the analog items already being produced, but the forecast values of the indicators of quality and the duration of production become the basis for comparison, and the linking of the technical parameters, which characterize the quality, with the economic indicators becomes mandatory.

The technical and economic level—a relative quantity, which shows the change of the values of the set of economically interconnected technical and value parameters of the new item as compared with the former item, which was taken as the base of reference—can act, V.V. Kochetkov believes, as such a generalizing indicator which reflects efficiency and quality. Such an indicator reflects the increase of the quantity of output or work, which was turned out per unit of the aggregate expenditures of labor or other resources, with respect to the base variant. Its basic advantage is the complete conformity of the content at all levels of management—from the technological process to the sector and the national economy as a whole—to the criterion of the efficiency of social production. Such an indicator creates the fundamentally new possibility of economically oriented and even economically standardized designing.

But such integration of indicators is only one of the possible means of improving evaluation. Ye.V. Sapilov (the Institute of Economics of the USSR Academy of Sciences), on the contrary, considers it necessary to extend the differentiation of the evaluation and to evaluate autonomously the different groups of properties of a new item. But the main thing, he believes, is to improve the very procedure of certification: today, regardless of who formally belongs to the certification commission, the manufacturing ministry itself actually evaluates the item. It specifies the main thing: according to which indicators the evaluation should be made and what the values of these indicators in the item being certified should be. While the state certification commissions only have to check whether the standard technical documents conform to the formulated requirements, while the product itself conforms to these documents, standards, and specifications.

Under such conditions the evaluation cannot be objective. It is necessary to give it an intersectorial nature, moreover, the consumer should play the leading role in the specification of the basis for comparison and in the substantiation of the leading indicator—the extent of satisfaction of the needs for some properties or others of the product. Today in the list of parameters of an item, which are approved by ministries, this indicator is altogether absent. And not the conformity of an item to some parameters or analogs, which have been selected by the producer, but such characteristics as the technical level, level of quality, and economic efficiency should be evaluated. The appraisal on each of these characteristics should be made autonomously, and the decisive role in each case should belong to representatives of the ministries and departments, within whose competence the specification of the corresponding demands on the product and the monitoring of their observance are. In this case every commission member will be responsible for the results of his own work both to the executive of the manufacturing ministry, who approved the composition of the commission, and to the executives of "his own" ministry, which he represents.

Several components govern the highest quality category: the novelty and promise of the technical solution, the conformity to or the exceeding of the technical level as compared with the best world achievements, the conformity to the national economic need, the economic efficiency, and the competitive ability. Accordingly, there should apparently be included on the commission representatives of the State Committee for Science and Technology—for the evaluation of the scientific and technical novelty and promise of the decisions and design, of the main ministry for the production of the given product—for the evaluation of the scientific and technical level, of the ministry that is the client or the basic user—for the determination of the level of quality and the economic efficiency (for consumer goods the Ministry of Trade), and of the Ministry of Foreign Trade—for the evaluation of the competitive ability of the product.

Of course, for the preparation of conclusions the members of the certification commission should have the right to enlist in this work competent specialists from scientific institutions and enterprises and to pay them for the expenditure of labor on the preparation of information and reference materials and for consultations. The work of the very members of the commissions should also be paid for as the work of experts—given such an approach and given the great responsibility for the conclusions considerable expenditures of time are required of them.

But given such a procedure wi" consumer also not begin to make excessive, economically unfounded demands on the producer? No, because in the overstatement of the demands on the product being certified the consumer is restricted by the price. Too great demands will lead to the increase of the cost of the product, while this will run counter to the cost accounting interests of the consumer himself. As for the producer enterprise, the aspiration to obtain a markup on the wholesale price for a product of the highest quality category will stimulate the collective to achieve the technical and economic parameters, which will provide the maximum national economic impact. The common interest of the producer and the consumer in the maximum economic impact will be conducive to the selection of the most effective solutions.

It would perhaps be also useful to introduce the procedure of preliminary publications on the planned certification of one product or another for the awarding to it of the State Emblem of Quality and to establish the institution of official opponent organizations, which evaluate the fulfillment of the national economic demands on the technical level, quality, and economic efficiency of the product. Scientific institutions, which study the demand for a product, its competitive ability, prices, and so on, and enterprises for the repair and maintenance of household appliances could be such organizations.

The Improvement of Research and Development and Their Evaluation

One of the causes of the slow, small-scale assimilation of the production of new equipment, Ye.V. Sapilov recalled, is the lack of confidence in its design quality and economic efficiency. Indeed, in many cases the planned technical and economic parameters are not achieved not only in series-produced specimens, but even in prototypes. The prevailing methods of the evaluation and stimulation of the work of scientific research and planning and design organizations are not capable of putting an end to such a situation. It is necessary to extend to planning and design developments the system of the state certification of product quality, having supplemented the economic indicators of the evaluation of the activity of organizations, which are used today, with the direct appraisal of the quality and the scientific and technical level of the decisions incorporated in the design. A methodologically unified system of the gradation of quality, which encompasses all the stages of the life cycle of an item, starting with planning and design development and ending with mass production, and applies to all sectors, is necessary for this.

It is also important to create sufficiently strong stimuli for developers. The transfer by the producer to their economic stimulation funds of a portion of the amounts, which were obtained from the markups on the price for the product of the highest quality category, which was developed by them, in itself does not create such stimuli, P.Ye. Belenkiy believes. First, too much time passes from the completion of the design work to the obtaining of the reward and, second, the sum of the transfers depends first of all on the volume of output of the new product, while this amount in no way depends on either the developers or the quality of labor.

In a number of socialist countries the product of planning, design, and technological organizations is sold in the same way as other products—on the basis of a set of prices. Of course, it is even more difficult to establish the prices for designs than for finished items. At first the changeover to contract prices for designs could be a compromise version. So that developers would be more interested in the decrease of the expenditures on the design and in the increase of its quality, it is possible to supplement the system of contract prices with a system of competitions. The assets, which have been saved from the initially established amounts or have been additionally paid by the consumer for the high quality of the design, can be used for the additional remuneration of the developers in accordance with the end result.

An interesting system of the comprehensive stimulation of developers and the monitoring of quality is used in the GDR. G.A. Vlaskin told about it.

A three-level system of the planning, control, and monitoring of product quality has been established in the country. At the level of the Council of Ministers, the Office for Standardization, Measurements, and Product Testing is in charge of these matters and at the sectorial level the sectorial ministries are. The system of monitoring at the level of the basic reproduction units—the combine—is most branched. Various functional subdivisions—laboratories of reliability, metrological laboratories, monitoring and diagnostic centers, and so forth—are established within the monitoring services.

The drafts of the plan on science and technology, in which all the basic questions of quality are reflected, are drawn up and sent to superior organs 6 months earlier than the other sections of the plan. This makes it possible to study in good time the steps on the scientific, technical, and financial support of the corresponding measures.

The "notebooks of obligations" on assignments on research and development, which were mandatorily introduced starting in 1982, are the basis of the quality assurance of a new product. The "notebook of obligations" is included as a most important component in economic contracts for the conducting of research and development. All the questions of the conducting of research and development, starting with the technical and economic parameters of the models being developed and ending with the amount of financing and the research and development staffs, are specified in it. Here particular attention is being devoted to the increase of quality. The quality is evaluated on the basis of the following criteria: *productivity, reliability, and durability;*

the "weight-productivity" ratio; the use of the latest technology; the decrease of the consumption of power, raw materials, and materials; the ease of maintenance and repair; the influence on the working and living conditions of workers; a modern appearance; the reduction of expenditures on the correction of defects and on warranty repair. At practically all combines specific tasks are set for researchers and developers: every new type of product should receive the highest quality category; the index of consumer properties should actually be increased by not less than 15-20 percent; the expenditures of time on production should be reduced by 10-30 percent; the consumption of power, labor, and materials should be decreased by 30 percent and more; the "weight-productivity" ratio should be improved by not less than 20 percent; the existence of original ideas should find expression in the obtaining of a patent, while the export of the given product should increase, often by up to 50 percent and more. Only in special cases can the time of development exceed 2 years.

Before the parameters outlined in the "notebook of obligations" are approved as planning parameters, they should be submitted for approval to the basic consumers, to organs of domestic and foreign trade, and to the department for standards, metrology, and quality. The latter annually does not approve and sends back for modification up to 20 of the "notebooks of obligations," which are submitted to it, ordering the scientific research organizations to perform additional work and to seek reserves for the improvement of the parameters, which should conform to the world standards or exceed them. Such great demands on the quality of the types of products being developed in case of the strict monitoring of the fulfillment of the plans of work and the personal responsibility of each manager for the given assignment and the extensive use of steps of stimulation are having the result that already now 70-80 percent of all the products of leading combines have the highest quality category, and a significant portion of them are being exported. The existence at the combines of their own scientific research base and extensive contacts with institutions of the GDR Academy of Sciences and the higher school is also playing no less a role. Particular significance is being attached to individual material stimulation from cost accounting funds. A peculiarity of the wage system is the breakdown into the basic and variable (10-30 percent) part. The latter is paid subject to the specific results of labor and comes to 75-120 marks for production workers and engineering and technical personnel and up to 300 marks for researchers and developers, to whom half of this amount is paid monthly, while half is paid after the completion of the work in case of the achievement of all the set goals of research and development. This form is used in unity with other forms of stimulation—the payment of increments to the participants in the most important scientific and technical programs and the payment of bonuses for the results of labor.

The collective stimulation of product quality also involves the formation of cost accounting funds on the basis of the increase of the prices for high quality products. If the goals of the "notebook of obligations" are exceeded or the entire amount of work is fulfilled ahead of time, an additional profit in the amount of 50 percent of the standard profit is paid. If a new type of product, which surpasses in its indicators the best world models, has been developed, the "excess profit" comes to 100 percent of the standard profit. All of it is placed at the disposal of the scientific research organization, moreover, 30 percent of it is put in the bonus fund, while 70 percent is put in the "fund of results," the assets of which are used mainly for the improvement of the working and living conditions of workers. In case of the partial nonfulfillment of the goals on individual quality parameters, which have been set in the "notebook of obligations," the standard profit is reduced by 25 percent, while in case of the complete failure of the assignment it is not paid at all. The expenditures on research in this case either are reimbursed in part or are not reimbursed at all.

The Experience of Developed Capitalist Countries

Much experience of different kinds of measures on the increase of product quality has been gained today in industry of the developed capitalist states. The world economic crisis, which sharply intensified competition, contributed considerably to this. While on the world market today price competition—competition in the decrease of the cost of products—is being replaced more and more by competition in quality. Thus, the great competitive ability of Japanese goods on the world market is explained precisely by the superiority of quality, especially of consumer goods, L.A. Kokoreva (the Institute of the United States of America and Canada of the USSR Academy of Sciences) recalled. A survey of executives of 1,500 American firms, which was conducted in the United States in 1982, showed: the greater the reputation of the goods of one firm or another is, the higher the main indicator of its financial well-being—the return on capital—also is. The firms, which in the 1970's improved product quality, increased their share on the market threefold more rapidly than those, whose quality remained the same, and five- to sixfold more rapidly than those, whose quality decreased. L. Harrington, a quality control specialist of IBM, asserted: "Product quality is the basic battlefield on the world markets of the 1980's, and the cost of losing this struggle is economic catastrophe."

At present in the United States even at a well-organized works from 15 to 40 percent of the production capacities are used for the alteration of defective output, the correction of defects, retesting, and control. Not by chance do many executives of American firms state that the reduction of production defects by only 2 percent leads to an increase of real productivity by 10 percent. Statistics show that $1, which is invested in the analysis of the causes of defective output and its prevention, makes it possible to save $9 of expenditures on technical control and tests and $15 due to the decrease of losses from defective output.

In many countries the problem of quality is beginning to be regarded as a problem of a national nature, and governmental organs are also being enlisted in its solution. In the United States in 1982 a national advisory council for quality was established. The special assistant to the president for consumer affairs, the vice president of the American center for problems of productivity, the assistant for quality of the U.S. deputy secretary of defense, representatives of quality control departments of the largest military departments, and vice presidents and directors for quality of the largest corporations became members of it. The task of the council is to formulate directives on the improvement of quality on a national scale.

In October 1984 the first national month of quality under the motto "Quality Above All!" was held in the country. The Senate adopted in this connection a special resolution, while President Reagan made an appeal to the people. In the organization of such months the United States is following the example of Japan, where they have been held annually since 1960. In April 1983 a national quality campaign was held in Great Britain. Among the measures were the organization of a national information center on product quality, the establishment of a special system of state prizes for high product quality, the strengthening of the cooperation of all national organizations, which deal with questions of standardization, product quality, and international trade, and the publication of a special register of firms, which have been certified as "producers of high-quality products."

National organizations that play the role of centers, which gather and disseminate advanced know-how of product quality control, operate in all industrially developed countries. With respect to their status these are professional organizations and scientific and technical societies. The American Society for Quality Control operates in the United States. All of them have been organized according to the principle of the combination of the goal program and territorial structures of control: within them there are both numerous technical committees, which deal with various problems of quality control, and various regional affiliates.

Numerous specialized consulting firms, which are being established by the most prominent specialists with much experience in practical work, are also playing a large role. In accordance with contracts with firms, which are the manufacturers of products, they can formulate and introduce a specific comprehensive program of the increase of quality, make an analysis of the causes of the output of low-quality products, organize and conduct the training of personnel in methods of quality control and the analysis of reliability, formulate recommendations on various aspects of the improvement of the quality of products and labor, and so forth. Consulting firms specialize in both general and specific questions. In the latter case they are established, when the need arises, for the dissemination of specific knowledge, methods, and know-how.

But, of course, the basic work on the increase of product quality is taking place at the level of enterprises and firms, where this problem is regarded first of all as an organizational management problem. All the most prominent specialists in the field of quality control constantly emphasize that rank and file workers and employees are to blame for only 20 percent of the mistakes, defects, and deviations from the established norms, management and the system of administration are to blame for the remaining 80 percent of the cases. For example, Japanese managers bear real responsibility for product quality, and not simply the responsibility declared in documents. There, in particular, at each firm all the personnel, from the president to the rank and file worker, have been trained in the seven basic methods of statistical quality control.

Specialists see one of the causes of the lag of the United States behind Japan precisely in the lack of proper attention to problems of quality. And throughout the 1980's in American corporations quality control has been moving to a higher and higher level. The positions of vice president for problems of quality and reliability have been established at a number of large corporations. "Management philosophy" itself is also being reformed. The understanding that it is impossible to decree and ensure by orders high quality is increasing—constant daily attention is necessary. The personal responsibility of managers for quality is being increased, his role in the determination of the amount of material payments to superior managers is increasing. In some companies the products of each of the plants are compared with the aid of a computer with the products of competitors with respect to a large number of quality indicators, and the obtained comparative evaluation is taken as the basis when deciding on the further promotion of the corresponding managers up the job ladder.

At Japanese plants priority in general is given to the level of quality over quantitative indicators. The worker can even stop the conveyor line, if he does not have time to perform an operation in a high quality manner. As a manager of Toyota believes, if the conveyor line is down for an hour, this is bad, but if it is not halted at all, this is even worse: either the time allowances for an operation have been overstated or proper attention is not being devoted to its quality. A total downtime of a conveyor line of 20 minutes is considered permissible. Every 2 hours the workers on the conveyor line change places, in order to reduce the rate of fatigue from the monotony of work. Moreover, the conveyor line has been designed so that the workers, who perform the initial operations, would see the final product—this strengthens the awareness of the significance of the job being performed.

The "quality revolution," which Japanese industry experienced in the 1960's and 1970's, is arousing particular interest throughout the world. The success of Japan in this "revolution," as V.K. Zaytsev (the Institute of World Economics and International Relations of the

USSR Academy of Sciences) noted, was ensured by many factors: the radical updating of fixed capital and the purchase of the latest technical and technological achievements abroad, extensive programs on the study of the advanced theory and practice of the assurance of high product quality, the devising, development, and extensive use of modern means of standardization and control, the organizational reform of intrafirm management, and very effective steps on the development of comprehensive quality control systems. And, what is the main thing, constant, intense work with personnel (in Japan sixfold more time is spent on the vocational training of a skilled worker than in the United States). Here companies are oriented for the most part toward the intrafirm training of personnel. The basic strategic principle of the training of management personnel is the creation of a "universal worker." For this first of all the system of rotation is used—every 3-5 years a worker is transferred from one section to another. Given the radical change of the nature of work during rotation a worker of broad specialization is formed—as a rule, for use in the future as a manager; in case of a transfer to relatively similar specialties a narrower specialist with thorough, comprehensive knowledge of a specific section of production is formed.

Such a system of personnel training facilitates the settlement of various questions which are connected with the reorganization of production and technological processes. At present in Japan they are changing over from the strict regulation of the labor process to new flexible methods of its organization. Practical experience shows that the system of strict regulated labor is inefficient: initiative is required of the performers. Therefore, more and more functions on the organization of labor are being transferred to the performers themselves. The establishment of autonomous and semiautonomous groups, to which responsibility for the fulfillment of their production plans and for product quality is assigned, increases labor productivity by up to 50 percent. But one of the most effective means for stimulating the creative potential of personnel is the broad movement of enterprising "small groups," which participate in the rationalization of production, in the search for new possibilities of the reduction of the production cost and the increase of product quality, and in the identification of "bottlenecks" in the technical and organizational sphere, which can be seen only by the immediate participants in the labor process. What are called "quality circles" have acquired particular popularity. In contrast to similar circles of Western Europe and the United States, which began to be developed in imitation of Japanese circles, in Japan not so much quality control in itself as the organization of all kinds of efficiency and creative activity of workers, especially young workers, is their basic function. About 110,000 similar circles, which encompass approximately 8 million people, have been registered in industry of Japan. The number of unregistered circles, according to Japanese estimates, is eightfold greater. Each member of a circle on the average accounts for seven introduced efficiency proposals a year, while the average saving due to the implementation of one proposal comes to about $5,000. In the work of the circles it is extremely important to let the participants feel that no proposal remains unexamined. At the leading companies of Japan about 85 percent of the submitted proposals are introduced.

Today the work experience of such circles is arousing increasing interest throughout the world, particularly in the United States, where they are actively attempting to introduce them at the most different enterprises. However, for the present only a third of the established circles are operating successfully, while a third of the attempts to organize them in general end in failure. Among the causes of the failures are the strict style of management, the lack of free forms of interrelations between managers and workers, a poor moral climate, the lack of confidence in workers on the part of management, due to which workers feel like "small screws," the inadequate readiness of managers of the lower level and their hostility toward the work of circles, which seek out shortcomings in the work with quality and, consequently, in the activity of these managers themselves, the inadequate influence of the members of circles on the production system even at the microlevel, and the lack of a real, and not only declared interest in questions of quality on the part of superior management.

As a whole the discussion showed: today all specialists agree that the problem of increasing the quality and technical and economic level of products cannot be solved in isolation, out of contact with the more general problems of pricing, planning, the development of cost accounting relations, the stimulation of the human factor of production, and so forth. At the same time the problems of quality have a definite specific nature and should be examined collectively, from a unified, common point of view.

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Structure Of Scientific, Technical Subdivisions Of Enterprises

18140004 Moscow MASHINOSTROITEL in Russian No 6, Jun 87 pp 28-30

[Article by Doctor of Economic Sciences Professor A.M. Mukhamedyarov: "The Increase of the Efficiency of the Use of the Scientific Potential of Enterprises"]

[Text] The need for the strengthening of the plant sector of science and the inclusion within scientific production associations, production associations, and enterprises of sectorial scientific research institutes and design and

technological organizations is indicated in the Basic Directions of USSR Economic and Social Development for 1986-1990 and the Period to 2000. Thus, the formation and development of the plant sector of science are acquiring new traits which are increasing its significance in the overall scientific system of the country.

It is possible to characterize the plant sector of science as a set of scientific and technical subdivisions (research, design, experimental, technological, and others) of enterprises and associations with their scientific potential and relations with other organizations, which perform scientific, production economic, and social functions and are united by the fulfillment of common tasks—the increase of efficiency and the introduction of innovations. Such a sector is characterized by specific parameters, in particular, by the potential (personnel, organizational, expenditures), which should be used efficiently.

The factual data of the plant sector are comparable to the parameters of the other sectors of science. Here are several data on the personnel component of the scientific potential of enterprises (associations). About 8 percent of the scientists of the country, including 2.5 percent of the candidates and 0.8 percent of the doctors of sciences, are employed in the planning and design and the technological subdivisions of enterprises and associations. As the results of the study showed, about 40 percent of the engineering and technical personnel and employees are employed in the scientific and technical subdivisions of enterprises and associations, while the degree of their participation in scientific and technical activity for industry as a whole comes on the average to about 54 percent. The proportion of the number of engineering and technical personnel, who are engaged in scientific and technical activity, comes to 22 percent in industry, including 24 percent in the electrical equipment and radio industry and 18 percent in the sector of light and food machine building.

The scientific potential is also characterized by expenditures. At enterprises and associations, within which many scientific research institutes and design bureaus, which are contributing to the development of the plant sector of science, are successfully functioning, the determination of the total expenditures on scientific and technical activity is complicated by the difficulty of the unambiguous grouping of the labor activity of the engineering and technical personnel of many subdivisions with scientific, technical, or production activity. For many subdivisions of enterprises, which are carrying out scientific and technical development, deal in part with promising developments, the assimilation and introduction of developments of independent scientific research institutes and design bureaus, as well as the servicing of current production.

This raises two questions: Which subdivisions of enterprises (associations) can be grouped with scientific and technical subdivisions; in what ratio is the time of the workers of these subdivisions for long-range development, assimilation, and the servicing of current production broken down? When setting these questions there were determined in accordance with a specially developed method: the composition, structure, and size of the subdivisions of enterprises, which are engaged in scientific and technical activity and form the plant sector of science; the degree of participation of the workers of these subdivisions in development and the assimilation of new types of products and the servicing of current production; the total expenditures on scientific and technical activity at associations (enterprises). Expert methods, the methods of self-photography, instantaneous observations, and written questionnaires were used for increasing the accuracy of the determination. Here the difference in the evaluations came to 15-23 percent.

The calculations showed that the expenditures of scientific and technical subdivisions in 1984 came to about 30 percent (of the expenditures taken into account by statistics) and about 27 percent (of the total expenditures), in the electrical equipment industry they are respectively equal to 40 and 28 percent. Here there is the tendency for these expenditures to increase gradually. Only 10-20 percent of the expenditures of enterprises (associations) on scientific and technical activity are compensated by means of the Unified Fund for the Development of Science and Technology (YeFRNT). Thus, the enterprises' (associations') own expenditures on carrying out scientific and technical activity in comparison with the assets of the Unified Fund for the Development of Science and Technology (a ratio of 1:4) represent a significant amount and should be taken into account when estimating the spending on the development of science in the long-range plan.

The need for the increase of the efficiency of the use of the scientific potential of enterprises (associations) requires the further improvement of the methods of management, the organizational structure of the subdivisions, and the planning, stimulation, and evaluation of the efficiency of their activity.

The formulation of a general concept and methods of the management of the plant sector of science with allowance made for the multipurpose nature of its functioning, the interrelations with the socioeconomic environment, and social relations is exceptionally important. All of this is complicated by the interweaving within plant science of the interests of two dynamic systems—science and production. Here management can be oriented: toward the results, toward the process of scientific and technical activity in the subdivisions, and toward a synthesized approach. In the first case, having a stable, traditionally formed, formal organizational structure, it relies mainly on economic indicators; in the second it relies on conditions, which at times are opposite to economic conditions: sociopsychological motives, the internal logic of the development of research, prestige, a

less rigid hierarchical structure, and the formal regulation of organizational processes; in the third all these aims and methods can be united into a single whole.

The improvement of the organizational structure of the scientific and technical subdivisions of enterprises of machine building should be carried out with allowance made for the fact that they form a system of the plant sector of science. The basic directions of the improvement of the structure are:

—the efficient specialization of the scientific and technical subdivisions of enterprises and especially production associations;

—the streamlining of the development of the composition of these subdivisions (the optimum ratio between newly established subdivisions, traditional subdivisions that are being expanded, and developing independent special design bureaus and scientific research institutes, which form a part of associations and enterprises);

—the identification of the principles of their sound formation and the unification and standardization of names and organizational structural concepts;

—the streamlining of the subordination and cosubordination of subdivisions with the strict regulation of the functions performed by them;

—the well-founded determination of the size of scientific and technical subdivisions with allowance made for the nature of their activity and place in the system of plant science, as well as the ratio between the different categories of personnel.

The analysis of a number of subsectors of machine building showed that the unification and standardization of the organizational management structure of scientific and technical subdivisions are lacking at enterprises. Thus, at enterprises there are about 65 names of scientific and technical subdivisions (in particular, 35 different names of design and technological subdivisions). This frequently leads to a different interpretation of their interconnection with production, different subordination and administrative responsibility, the number of personnel, and salaries.

In machine building the need for a generally accepted sectorial and subsectorial standard terminology and a common interpretation of several basic organizational management concepts is quite obvious. There is meant here the need for the standardization of not only the names of subdivisions and their components, but also the functions of individual subdivisions of the same name, as well as their subordination. Thus, first of all the unification and standardization of if only 10-15 basic concepts, which pertain to the name of subdivisions and their structural units, are necessary.

There seems valid in this connection the reduction of the number of names of design subdivisions of enterprises (associations) to three: the SKB [special design bureau] (which is relatively independent under the plant), the OGK (division of the chief designer), and the SKO (series design division); the names of technological subdivisions to two: the OGT (division of the chief process engineer) and TO (technological division); the names of design and technological subdivisions to one: the SKTO (B)—the special design and technological division or bureau; the subdivisions for mechanization and automation to one: the OMA [division of mechanization and automation]; the subdivisions of patent research to one: the division or bureau of patent studies.

In essence the recommended names of subdivisions as unified ones (in the future this may become the basis for standardization on the sectorial level) encompass the entire set of operations which are presently performed by tens of different subdivisions. All types of operations on planning and design preparation: the development of fundamentally new items (the special design bureau), the development of new types of products and their modified versions (the division of the chief designer), and the partial modernization of items being produced (the series design division), can be performed in design subdivisions of 3 types (instead of the 18 existing types). Typification can also be carried out with respect to the internal structure of subdivisions. The analysis showed that here a different meaning is also incorporated in the same name (for example, division or bureau), the functions and nature of activity are interpreted in different ways even at a single enterprise.

For the purpose of the unification of the internal structure any scientific and technical subdivision, which is a part of the complex of plant science, on the organizational level can be formed after the pattern: the division—the bureau—groups (brigades). Such a classification is based on the existing and quite widespread terms. Depending on the nature and amount of work and the importance of the tasks being fulfilled the subdivision can have the following simplified structure: the bureau—groups (brigades). The three-stage structure of the scientific and technical subdivision (instead of the eight existing ones in different, at times contradictory combinations of names) is advisable for enterprises (associations) of the sectors of machine building. The procedural recommendations on the improvement of the organizational structure of scientific and technical subdivisions are undergoing additional experimental checking at a number of enterprises of machine building.

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New Members of Tajik SSR Academy of Sciences

18140167 Moscow KOMMUNIST TADZHIKISTANA in Russian 12 Dec 87 p 3

[Article by TadzhikTA: "From the Tajik SSR Academy of Sciences"]

[Text] At the 11 December 1987 general meeting of the Tajik SSR Academy of Sciences the following were elected: **Full member of the Tajik SSR Academy of Sciences:** Mikhaylov, Leonid Grigorevich — mathematics; Negmatullayev, Sobit Khabibullayevich — seismic engineering and seismology; Rakhimov, Rashid Karimovich — economics; Saidmuradov, Khabibullo — economics; Sanginov, Bobo — selection and seed growing; Shukurov, Mukhammad Sharipovich — philology. **Correspondent members of the Tajik SSR Academy of Sciences:** Kamelin, Rudolf Vladimorovich — biology; Karimov, Dzhamshed Kilolovich — information science; Mirsaidov, Ulmas — chemistry; Nazarov, Khaknazar — history; Radzhabov, Nusrat — mathematics; Rustamov, Sharofiddin — philology; Tursunov, Akbar Tursunovich — philosophy; Khakimov, Fatekh Khalikovich — physics. 11574

New Members of Lithuanian SSR Academy of Sciences

18140153 Vilnius SOVETSKAYA LITVA in Russian 9 Dec 87 p 4

[Article by Presidium of LiSSR Academy of Sciences]

[Text] PRESIDIUM OF THE LITHUANIAN SSR ACADEMY OF SCIENCES

In accordance with Section 20 of the Academy of Sciences Charter, these are the names of the candidates for full membership (academicians) and correspondent membership to the LiSSR Academy of Sciences presented by scientific institutions and higher educational institutions based upon notification in the Newspaper *Sovetskaya Litva* on 31 October 1987, No 251 (13464).

CANDIDATES FOR FULL MEMBERSHIP (ACADEMICIANS)

Department of Physical-technical and Mathematical Sciences: Vilemas, Yurgis Vintsovich, correspondent member LiSSR Academy of Sciences (Power Engineering); Grigelenis, Bronyus Ignovich, correspondent member LiSSR Academy of Sciences (mathematics);

Ragulskis, Kazimeras, Mikolovich, doctor of technical sciences, professor (mechanics).

Department of Social Sciences

Raatskas, Raymundas-Lyaonas Lyanovich, correspondent member, LiSSR Academy of Sciences (economist)

CANDIDATES FOR CORRESPONDENT MEMBERSHIP

Department of Physical-technical and Mathematical Sciences:

Baltrameyunas, Remigiyus Antanovich, doctor of physical-mathematical sciences, professor (experimental physics);

Bentkus, Raymundas, Yurgevich, doctor of physical-mathematical sciences, (mathematics);

Bolotin, Adolf Borisovich, doctor of physical-mathematical sciences, professor (experimental physics);

Dagis, Raymundas Stasevich, doctor of physical-mathematical sciences, professor (theoretical physics);

Denis, Vintsentas Ionovich, doctor of physical-mathematical sciences, (experimental physics);

Maldutis, Evaldas-Kazis Kaziovich, doctor of physical-mathematical sciences, (experimental physics)

Matulenis, Avridas Yuozovich, doctor of physical-mathematical sciences, (element base for computer technology);

Montrimas, Edmundas Adolfovich, doctor of physical-mathematical sciences, professor (experimental physics);

Paulauskas, Vigantas Ionovich, doctor of physical-mathematical sciences, professor (mathematics);

Piskarskas, Algis-Pyatras Styapovich, doctor of physical-mathematical sciences, professor (experimental physics);

Pranyavichyus, Lyudvikas Ionovich, doctor of physical-mathematical sciences, professor (element base for computer technology);

Sakalas, Aloiza Pyatrovich, doctor of physical-mathematical sciences, professor (element base for computer technology);

Sapagovas, Mifodiy Parmenovich , doctor of physical-mathematical sciences, (mathematics);

Surgaytis, Donatas, Genrikovich, doctor of physical-mathematical sciences (mathematics);

Shugurov, Viktor Konstantinovich, doctor of physical-mathematical sciences, professor, (theoretical physics);

Yanushauskas, Algimantas Ionovich, doctor of physical-mathematical sciences, professor, (mathematics).

Department of Chemical-technological and Biological Sciences

Astrauskas, Vitautas Ionovich, doctor of medical sciences, professor, (physiology);

Baltrushis, Romuldas, Stasevich, doctor of chemical sciences, professor, (biotechnology);

Glemzha, Antanas-Skaystutis Antanovich, doctor of biological sciences, professor, (physical-chemical biology);

Kulis, Yuozas Yuozovich, doctor of chemical sciences, professor, (physical-chemical biology);

Matulis, Alfonsas Adomovich, doctor of medical sciences, professor, (physiology);

Paulyukyavichyus, Gediminas-Ionas Bronislavovich, doctor of biological sciences, (ecology);

Skirkyavichyus, Algirdas Vintsovich, doctor of biological sciences, (physiology);

Stanishkis, Yurgis-Kazimeras, doctor of technical sciences (biotechnology);

Styro, Dmitriy Boleslavovich, doctor of physical-mathematical sciences, professor, (ecology);

Tamoshyunas, Vitas-Antanas Ionovich, doctor of biological sciences, (physiology);

Eytminavichyute, Irena Styapovna, doctor of biological sciences, (ecology);

Yuodka, Benediktas Antanovich, doctor of chemical sciences, professor, (physical-chemical biology);

Yanulaytis, Eugeniyus-Arvidas Andrevich, doctor of biological sciences, (biotechnology).

Department of Social Sciences

Vanagas, Aleskandras Pranovich, doctor of philological sciences, (linguistics);

Zinkyavichyus, Zigmas Pyatrovich, doctor of philological sciences, (linguistics);

Kuzmitskas, Bronislovas-Yuozas Yuozovich, doctor of philosophical sciences, (philosophy);

Merkis, Vitautas Yuozovich, doctor of historical sciences, (history);

Shepetis, Lionginas Klemensovich, doctor of philosophical sciences, (philosophy).

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Economic Experiment, New Management Methods in Latvia

18140130 Riga IZVESTIYA AKADEMII NAUK LATVIYSKOY SSR in Russian No 9, Sep 87 (manuscript received 23 Feb 87) pp 3-14

[Article by I.Kh. Kirtovskiy, K.Ya. Sville, and G.B. Belosludtseva, the Institute of Economics of the Latvian SSR Academy of Sciences, under the rubric "Economics": "From the Experiment to the New Methods of Management"]

[Text] The economic mechanism needs constant improvement. However, now, as is known, the situation is such that one must not confine oneself to partial improvements—radical economic reform is necessary. The 27th CPSU Congress and the CPSU Central Committee plenums indicated this. The June (1987) CPSU Central Committee Plenum stressed that the restructuring of economic management and the economic mechanism is the central task which determines the success of the strategy of acceleration. Among the basic directions of the restructuring of the economic mechanism, it was noted at it, is the task to extend decisively the boundaries of the independence of associations and enterprises and to increase their responsibility for the achievement of the highest end results of work. The main means of accomplishing this goal is the introduction in the basic unit of our economic of full cost accounting, self-support [samookupayemost], and self-financing and the establishment of the direct dependence of the level of income of collectives on the efficiency of their production activity. The need for the continuation of the search and solutions of the improvement of the economic mechanism in its motives and orientation is thoroughly sound and practical. But its accomplishment is possible only on the basis of the corresponding scientific developments, the specific recommendations of scientists, which have been brought up directly to the level of practical use, and experimental checks.

Experiments in economics are one of the manifestations of the integrated processes in the scientifically sound formation of knowledge about the modern world. During the first years of new economic construction in socialist society V.I. Lenin already indicated the necessity and inevitability of experimentation: "We did not doubt that we would have to experiment, to conduct an experiment. We undertook a matter which no one in the world had undertaken in such breadth."[1]

The very process of the functioning of the national economy raises the question of the transition to such forms of the centralization of management, in case of which the required degree of unity of personal, collective, and public interests, which creates the most favorable conditions for the development of the creative activity and initiative of the working people in the matter of the acceleration of the pace of the intensification of production and its orientation everywhere toward the achievement of high end results, is ensured.

But this transition cannot be a one-time act and it should be carried out by stages, with the observance of a specific sequence. At the June (1987) Plenum it was noted that the restructuring of the economic mechanism and the system of management is a lengthy process.

At the first stage of the changeover to the new economic mechanism the creation of a new structure of the ... to-day economic independence of labor collectives and the increase of their responsibility for the results of work are required. Subsequently the possibility and necessity to change the forms and methods of centralized management in the direction of the universalization (aggregation) of sectorial management and planning will appear, having concentrated them on the decisive levers and forms of the supervision of socioeconomic development. Precisely such a means of improving the management of industry was outlined by our party. Its beginning was marked by the conducting in the country of a large-scale economic experiment, in order to give more rights to enterprises, to increase their responsibility, to free them from excessive tutelage of superior organizations, and to simultaneously make a check and develop new elements of management.

In the Latvian SSR in 1984 seven industrial enterprises were working under the conditions of the experiment. The results of the work for 1984 as a whole were positive, and in this connection directive organs of the country made the decision: after some specification and supplementing of the provisions of the experiment and the performance of the necessary preliminary work to broaden significantly the composition of the participants in the experiment. Starting on 1 January 1985 the second stage was conducted, in the Latvian SSR 14 machine buildings of union subordination, 29 enterprises of the Ministry of Light Industry, 24 enterprises of the former Ministry of the Food Industry, as well as 44 enterprises of the Ministry of Consumer Services worked under the conditions of the economic experiment. In 1986 in industry nearly half of the production associations and enterprises, which produced three-fourths of the volume of industrial output, worked under the new conditions of management.

At the June (1987) CPSU Central Committee Plenum M.S. Gorbachev noted that in "the past 2 years the first steps were taken in the assimilation of the new methods of management, which were formulated on the basis of the analysis of the situation at the turn between the 1970's and 1980's and a series of economic experiments..., but no radical, no fundamental changes have been achieved. The mechanism of deceleration has not been destroyed and has not been replaced by the mechanism of acceleration. It is necessary as before to offset its absence by extra-economic methods and administrative pressure."[2]

The analysis of the problems, the course, and the results of the economic experiment and the work under the new conditions of management not only makes it possible to verify the correctness of the theoretical solution, but is capable of providing such a number of practical solutions of the same problems, the representativeness and diversity of which enable science and management organs to find and formulate the basic principles of the long-range improvement of the practice of management as a whole, which are common to everyone. Unfortunately, it is now already possible to speak about the obvious tendency to retreat even from the not too far-reaching provisions of the economic experiment. Thus, in 1984 the requirement of the unity of economic standards was maintained nearly everywhere that the experiment was being conducted. Already in 1985 and even more so in 1986 the number of exceptions began to increase. Thus, with respect to the material incentive fund (FMP) the ministries along with the standards began to obtain planned amounts of the material incentive fund with respect to the sector.

The analysis of the materials of the written survey "On the Introduction of Full Cost Accounting and the Principles of Self-Financing in Labor Collectives," which was conducted by us, at the Sarkanays kvadrats Production Association showed that the new methods of management had not yet become the norm at the association, the bulk of those surveyed are still unfamiliar or do not have a clear idea of the basic provisions and principles of work under the new conditions, therefore, it is necessary to intensify the work on the promotion and explanation of the goal, task, and principles of the new methods of management at all levels—from the management to the rank and file worker.

The more efficient combination of the statewide, sectorial, and territorial approaches is one of the basic provisions of the improvement of the mechanism of planning. In real life in case of the improvement of the economic mechanism the basic attention is directed to the broadening of the rights and the increase of the responsibility of the basic unit with allowance made for the requirements of its interaction with the sectorial unit. Meanwhile there are a number of unresolved questions of the efficient combination of the economic interests of the basic unit and regions (the republic, rayons, cities). The functions facing the regions should be taken into account when developing the economic mechanism of the basic unit, particularly in case of the formation of the economic relations of enterprises and associations with organs of regional management. The problem consists in creating such conditions so that the subjects of the management of regions would be economically interested in the efficient work of the basic unit that is located in the region, regardless of their administrative subordination, and so that the basic unit would derive a socioeconomic advantage from the comprehensive development of the entire region.

The local budget has to be formed in a new way. All the enterprises of the region, regardless of administrative subordination, under the new conditions of work are obliged to pay to the local budget the fee for the use of

manpower and natural resources, as well as a portion of their profit. And this is entirely correct, inasmuch as all labor collectives are inseparably connected with the economic and social environment of the regions in which they live and work. Such interrelations rest on an economic basis and are a stimulus of the efficient management of the economy. At the same time it is necessary to eliminate the attempts at administrative interference in the activity of labor collectives and to get rid of the habits of administrative organs to dispose freely of the resources of enterprises. All the interrelations with regional organs should be organized under the new conditions on an economic, contractual basis.

At the June (1987) CPSU Central Committee Plenum M.S. Gorbachev noted that the new system will be efficient only if it is able to unite and harmonize the diverse interests of our society, including not only the interests of enterprises and sectors, but also the interests of republics, cities, and rayons, or, as is customary to say, territorial interests.

The system of the drafting of five-year and annual plans needs further development. Under the new conditions of management the balance of plans to a decisive extent determines the quality of the work of enterprises. Practical experience shows that the existing procedure of planning in itself is becoming a cause of imbalance, and first of all due to discrepancies in the times of the drafting of production plans and plans of material and technical supply. Thus, for example, at the Rigas manufaktura Production Association the 1985 plan was fulfilled, but shortcomings existed in the drafting and fulfillment of the plans of the sale of products: the conclusion of contracts, the redistribution of assets, and the issuing of orders continued nearly to the fourth quarter. At the Riga Illumination Engineering Plant, despite the fact that the 1984 and 1985 plans were delivered earlier than usual, they were not completely balanced with material and technical supply, in particular, the irregular delivery of sheet steel by the Zaporozhye Metallurgical Combine had an adverse effect on the systematic nature of production and the threat of full-day downtimes formed.

The process of drafting the five-year plan is changing qualitatively—the CPSU Central Committee and the Council of Ministers deemed it necessary under the new conditions, starting with the 13th Five-Year Plan, to reject the approval of annual plans—the enterprise will itself on the basis of the figures of the five-year plan determine its development for each year. But the main significance of these changes, of course, is that enterprises will get rid of the faulty practice of planning from what has been achieved, from the so-called base.

At the 27th party congress it was noted that in recent years the weakening of financial and credit influence on the economy has occurred. "Now," M.S. Gorbachev said at the June (1987) CPSU Central Committee Plenum, "the main shortcoming in this sphere is the separation of financial and credit resources and monetary assets from the movement of material resources and the supersaturation of the national economy with means of payment."[3]

As the results of the economic experiment showed, a substantial improvement of the results of the financial activity at the enterprises, which are participants in the experiment, is not observed. Having achieved the fulfillment of the plan on the most important production indicators, many enterprises are continuing to work with a shortage of internal working capital, are diverting it for unplanned goals, and are not fulfilling the established assignments on the commitment to the economic turnover of physical assets due to the speeding up of the turnover rate of working capital. The solvency of enterprises is often ensured by various types of subsidies, the postponement of the date of repayment of previously issued loans, and the issuing of new ones. Ministries on a large scale are carrying out the redistribution of planning assignments and financial assets, by increasing the load on well-operating enterprises and decreasing the responsibility of poorly operating ones for the results of management.

The proportion of unprofitable enterprises in industry alone in 1986 came to 13 percent. Their losses are a heavy burden on the national economy. And, unfortunately, many managers have begun to regard them as a normal phenomenon—the real struggle for the change of this psychology of thinking about the inevitability of the unprofitability of production still lies ahead.

Under the conditions of self-financing the system of noncompensatory financing is receding into the past. The state will concentrate assets of the budget primarily on the structural reform of the economy, the financing of comprehensive goal programs, the increase of the scientific and technical potential, and rapid social development.

The new economic mechanism requires of ministries the formulation of steps and specific deadlines with respect to the elimination of unprofitability. And if nevertheless all efforts prove to be fruitless and do not yield positive results, the USSR Law on the Socialist Enterprise envisages such an extreme step as the elimination or reorganization of the unprofitable enterprise.

The improvement of financial and credit relations should be carried out in the direction of the strengthening of the cost accounting stimuli of the efficient use of financing resources and, first of all, the organization of the working capital of the enterprise should be drawn into the system of cost accounting relations. Inasmuch as internal working capital is the financial base of the economic independence of the enterprise and ensures material liability for the results of economic activity, the tendency to reduce the internal sources of the formation of working capital should be overcome. For this the enterprise should ensure the increase of working capital,

as well as the offsetting of the allowed shortage by means of a cost accounting source, mainly the profit prior to its deduction for economic stimulation funds (in case of the standardized methods of its distribution). The financing of the activity of the enterprise should be based on the planned determination of the total need for working capital and all the sources of its formation in a unified credit and financial plan. It is advisable to finance the increase of internal working capital only by means of the profit of the enterprise. The allowed shortage of internal working capital should be made up by means of the internal accumulations of enterprises, and deductions for the material incentive fund are not made until complete restoration.

It is necessary to introduce the mandatory cost estimation of the material and technical supply (MTS) of these settlements with the estimate of expenditures on production. The conformity of the actual amount of production reserves to the standard should be the basic indicator of the payment of bonuses to workers of the material and technical supply services of enterprises. Payment credits should not be granted to enterprises which have above-standard reserves of commodity stocks.

The influence of cost accounting on the economic activity of enterprises in many respects is governed by the distribution and use of the profit. The increase of the stability of the standard of the distribution of the profit and the giving of important cost accounting functions to it are possible, if its amount is established not only the basis of the item-by-item determination of the expenses of the association and enterprise, but on the basis of consolidated economic standards for the five-year plan with respect to the most important expenditures of the financial plan. However, the principle of self-financing did not have a substantial effect on the independence of enterprises. The distribution of that portion of the profit, which is left to them in accordance with the standard, until now was regulated by the superior organization—it decided what percentage of the earned profit would go to the material incentive fund and what percentage would go to the production development fund, the fund for sociocultural measures and housing construction, and the unified fund for the development of science and technology.

Therefore, now, in conformity with the USSR Law on the State Enterprise (Article 15), the confiscation and redistribution of the profit (revenue) of enterprises, which is left after payments for resources and the payment of interest for credit in excess of the established standards, norms, and rates, are not allowed. The enterprise is allowed to decide itself where and for what it is advisable to allocate its profit.

Penalties, fines, and forfeits are one of the tools, which induce enterprises and associations to fulfill their contractual obligations in a high quality manner and are connected with the formation and redistribution of the profit. For the increase of the material liability of enterprises and associations for the fulfillment of contractual obligations the amount of penalties, fines, and forfeits should be increased. The increase of the influence of penalty sanctions on the amounts of the profit, which is used for meeting the internal needs of the enterprise, is the second direction. Given the existing system of the distribution of the profit in industry it is advisable to take the penalty sanctions into account after the making of priority payments, in order to increase their influence on the subsystem of the economic stimulation funds and the planned expenditures. The effectiveness of this proposal increases substantially under the conditions of the standardized method of distributing the profit. In case of a guaranteed amount of the profit for the budget penalties, fines, and forfeits should become a priority element of the distribution and use of that portion of the profit, which is left at the disposal of the establishmen..

An important place in case of the changeover to stimulation for the increase of efficiency belongs to the restructuring of the mechanism of the coordination of the wage fund with the results of production. The changeover from the coordination of the wage fund with the total production volume, which is used at present, to standards of the increase of the wage subject to the increase of the production volume is advisable. The introduction of full cost accounting requires that not only the material incentive funds, but also the wage fund would be formed subject to the increase of the profit. From a planned directive indicator the remuneration fund should become the cost accounting result of the work of the entire collective and the main portion of the remuneration should be earned. Only such a procedure can also serve as the material basis of the consistent implementation of the principle of social justice. Only in case of full cost account will material stimulation be able to become an effective tool of the campaign for the increase of labor production and for production efficiency.

So that the principles of self-support [samookupayemost] would become firmly rooted in economic practice, it is necessary to simplify as much as possible the procedure of pricing. The strengthening of the connection of pricing with the quality of the output being produced and with production efficiency is the most important condition of the changeover to the evaluation of economic activity for the level of efficiency. In this connection the task of increasing the flexibility of prices and of broadening the rights of enterprises in case of the establishment of prices within the framework of their state regulation is becoming a priority one.

The broadening of the rights of production collectives and the increase of their responsibility for the results of economic activity had a positive effect on the work of enterprises. For example, the fulfillment of contractual obligations at enterprises of the Latvian SSR in 1984 came to 99.6 percent, while in 1985—99.9 percent and in 1986—99.6 percent, the plan of the first half of 1987

was also not fulfilled. However, the number of indicators, which are planned from above for enterprises, not only did not decrease, but even increased (and comes to about 200). The number of directive indicators, especially with respect to science and technology, increased. In accordance with a provision of the experiment the indicators of the commodity and sold output were eliminated from the approved indicators, but in practice the notorious "gross" actually exists, the activity of the enterprise is evaluated in accordance with it, the directors are given incentives or are punished for this. Under the new conditions of management the volume of sales of products in conformity with concluded contracts serves as the basic evaluation indicator. Its use is conducive to the increase of the liability of suppliers to consumers and stabilizes economic relations: it is aimed at the comprehensive study of consumer demand and stimulates the more complete meeting of actual needs. However, one must not underestimate several negative aspects of this indicator.

First of all the now accepted form of accounting reflects more the interests of suppliers than of consumers: the plan on this indicator is also considered 100-percent fulfilled when the product is shipped on the 30th and 31st of the last month of the quarter. It is not aimed at the smoothness of delivery. Moreover, deliveries in large batches and to a limited number of addressees are profitable to producers. And, finally, the range of items, in accordance with which the fulfillment of the indicator is evaluated, and the specific assortment, which is specified by contracts, for the nonfulfillment of which penalty sanctions are imposed, do not coincide. As a result the 100-percent fulfillment of the indicated indicator can be accompanied by the payment of penalties for the insufficient delivery of individual types of products. Thus, for example, a number of enterprises of our republic fulfilled the indicator of the plan of deliveries by 100 percent in 1985, but did not cope with the plan of the total sales volume. For example, the Parizes komuna Textile Combine fulfilled the plan of the total volume of product sales by 93.8 percent, the Liyepaya Haberdashery Combine—by 96.1 percent, and the Rekord Production Association—by 99.7 percent.

It should be noted that, as the results of the work under the new conditions show, thus far it has not yet been possible to obtain an appreciable influence of the envisaged steps on the increase of the product quality of the enterprises which are operating under the new conditions of management. This indicator is increasing both at the enterprises and in the sectors, which have not changed over to work under the new conditions. In our opinion, the work under the conditions of the new methods of management should be aimed more precisely toward the increase of product quality and the balance of the production and deliveries of products with allowance made for their quality. The transformation of the increase of the volume of product sales with allowance made for the fulfillment of obligations on deliveries into the basic indicator of the evaluation of the economic activity of enterprises pursues the goal of a strict requirement—the 100-percent fulfillment of the contract of deliveries. Here a stipulation, which is very important for the accomplishment of the goal of the new methods of management, is omitted: deliveries with allowance made for the meeting of the demands of the supplier on the quality of the product being delivered. For the present the orientation toward the consumer is limited to the requirements of the fulfillment of the plan indicators on the basis of the obligations on deliveries in terms of the products list and on the dated indicated in the contracts.

The opinion voiced in the press that the work of enterprises, which produce consumer items, is to be evaluated in accordance with the products purchased by the population, and not in accordance with the products transferred to wholesale bases, received support at the 27th CPSU Congress. Of course, many questions will arise, for example, with what is the wage to be paid, by means of what is one to pay the accepted bills of suppliers? No modern works can do without the services of the State Bank. The issuing of credits "against accounts current" creates a stable financial status, but the smoothness, the punctuality, and, of course, the high quality of the filling of orders of contractual obligations are required for this. The role of the State Bank in settling such questions has room for growth.

The enterprises, which are the producers of poor quality products, as well as the organizations, which are their developers, should fully bear economic, material, and moral responsibility for this. The effectiveness of economic sanctions increases in case of their use in combination with other measures of responsibility, such as the banning of the sale of nonstandard products, credit and settlement influences of institutions of the USSR State Bank, the recovery of unauthorized monetary expenditures by organs of the people's control, the deprivation of bonuses, and others.

It is advisable to restore in the system of evaluation criteria at the stage of the drafting and fulfillment of the planned volume assignments the indicator of high product quality, which is established in an individualized manner for sectors of industry. The terms and principles of the work of enterprises under the new conditions of management do not ensure the necessary interest of associations and enterprises in the drafting of plans of the assimilation of the output of high quality new (modernized) products. Thus, in the opinion of Yu. Nikitin,[4] the proportion of products of the highest quality category is increasing slowly, because under the new conditions of management this indicator has ceased to be a fund-forming indicator: its value now does not have a direct effect on the amounts of the economic stimulation funds, therefore, a method of adjusting the incentive funds of associations (enterprises) subject to the degree of intensity of the adopted plans on quality as compared with the average sectorial level or the level of the industrial

association should be introduced. Such a practice, which was previously used at the enterprises of a number of machine building ministries, justified itself.

As the analysis of the work of enterprises under the new conditions of management shows, the wage fund also does not have a close connection with the indicator of the proportion of products of the highest quality category. The standard of the increase of the wage during the planned period does not take into account the increase of the labor intensity of the output of products in case of the increase of their technical and economic parameters, while the payment of bonuses to workers is not directly connected with product quality.

The system of stimulation for product quality should be revised, for it accounts for only 10 percent of the bonus fund, while the remaining 90 percent is used for the stimulation of quantity. The assets, which were obtained due to incentive markups on the wholesale price for high quality, dissolve in the material incentive fund. As a result the entire stimulating function of this portion of the bonus assets is lost. In our opinion, this additional profit, which is channeled into the material incentive fund, should be used for the payment of bonuses to those workers and production subdivisions, which by their labor ensure the awarding to the product of the State Quality Emblem. Now, under the new conditions of management, enterprises can themselves, without waiting for instructions from ministries, revise the system of stimulation and link fundamentally the questions of the increase of the technical level and quality of products with the principles of full cost accounting, self-financing, and self-support [samookupayemost], with the further broadening of the rights, independence, and responsibility of enterprises, and with the fulfillment of contractual obligations on deliveries.

The increase of the quality of items and the punctual fulfillment of contractual obligations—all this in the end leads to an increase of the amount of profit. For example, the Sarkanays kvadrats Production Association in 1987 is changing over to self-financing and plans to use for its own needs 36 percent of the accounting profit, or more than 9 million rubles, and neither the state budget nor ministries have the right to confiscate these assets.

One of the means of increasing product quality is to learn to work efficiently and stably, without crash work, by distributing uniformly the monthly load. The experience of the Biolar and Darba spars associations and a number of plants—the Illumination Engineering Plant, the Etalon, Kommunalnik, and other plants, at which all products are marked with the honorable pentagon, convincingly attests that the smoothness of production is the closest ally of quality. As a whole for the republic about 43 percent of the output is produced during the third 10-day period of the month, while at such associations as the Tekhnopribor and Stars associations and the Energoavtomatika Plant up to three-fourths of the finished output is turned over on the last days. Precisely during this period the number of deviations from the technical specifications increase sharply, entire technological operations are violated, and at times are omitted. That is why an end should be put to crash work, which was and remains the enemy of high quality, and efficient and smooth worth should be organized everywhere.

In neither the evaluation, wage-forming, nor fund-forming indicators is there a single indicator, which reflects the aggregate or interconnected saving of material, manpower, and monetary resources which are involved in the process of reproduction. The basic emphasis in the stimulation of the efficient use of the assets made available to the enterprise is placed on the decrease of expenditures only at the production stage of the circulation of productive capital, by using the indicator of the decrease of expenditures per ruble of commodity production as the fund-forming indicator. A significant portion of the material and monetary resources at the other phases of the reproduction cycle are ignored. The indicator of the profitability of productive capital should be used, especially in materials-consuming sectors, as the evaluation or fund-forming indicator.

Given the increasing role of independently made decisions, the value indicators should take into account the possibilities of centralized influence and the cost accounting activity of enterprises. In this connection the indicators of the net output, the profit, and the profitability are most acceptable. The volume of sold output with subsequent modifications plays a special role. The consideration of the fulfillment of delivery contracts seems insufficient. It is necessary to increase it by the fulfillment by the enterprise of the terms of payment of suppliers for the products and to change over to the consideration of this indicator not with respect to the moment of shipment, by with respect to the moment of payment for the product, which would stimulate smooth shipment and the prompt meeting of the demand. In this connection for the increase of the role of economic relations one should introduce the material liability of the client for the untimely payment for assets, which were delivered in accordance with the plan and contracts. For this the amounts, which were not paid for assets on the set dates, are to be eliminated from the amount of product sales (the performance of work) and from the indicator of the fulfillment of the plan on the volume of product sales with allowance made for the fulfillment of obligations on deliveries.

The economic mechanism, which is in operation in the national economy, in sectors will be ineffective, if the organization of the remuneration of labor at enterprises does not ensure a great interest of each collective of the subdivision and each worker in the increase of the quality and efficiency of individual and collective labor and its results. First of all, it is necessary to improve significantly the system of stimulation at enterprises—to ensure a specific connection between the positive and negative characteristics of labor and its results, on the one hand, and the wage, on the other. The forms of the

relative freeing of personnel (by the combining of occupations, the increase of the service areas, and so on) have not received the proper backing with stimuli due to the orientation toward the average achievements and the fear of a large differentiation of wages. Behind this, of course, is the experience of long years of management, when a decrease of the wage rates followed immediately after the actual increase of the wage, and as a rule a more strict plan on the number of personnel came down for the next year.

The assurance of the more efficient use of manpower resources is also another of the basic tasks of the improvement of the economic mechanism. In the accomplishment of this task the combination of the limit distribution of manpower resources, on the one hand, and the creation of a mechanism of the genuine interest of every collective in the saving of expenditures of labor, on the other, are urgent. The establishment of conformity between the availability of manpower resources and workplaces not only for the country as a whole, but also for individual regions will make it possible to increase the volume of output on the basis of the better use of all production resources and at the same time will create one of the basic prerequisites for the complete use of the economic levers which are incorporated in the modern economic mechanism.

The radical reform of pricing is an important component of the restructuring of the economic mechanism. It should play a stimulating role in the improvement of the use of resources, the decrease of expenditures, the increase of product quality, the acceleration of scientific and technical progress, and the rationalization of the entire system of consumption and distribution.

For long years the system of prices dictated the extensive means of development, prices did not reflect the actual socially necessary production costs, and, on the one hand, in the end all this led to the rapid increase of subsidies in the production and sale of the most different types of products, which comes to 73 billion rubles, and, on the other, for a number of products an economically groundlessly high level of profitability exists.[5] That is why the following situation is also forming—those, for whom the prices for products have been understated, do not have a stimulus for the increase of the production volume, while those, who due to overstated prices have a groundless overstated level of profitability, are deprived of stimuli for the decrease of expenditures and the increase of production efficiency. That is why the question of the quickest improvement of the system of pricing and the interconnected restructuring of the entire "price establishment" was urgently raised at the June (1987) Plenum.

At one time it was believed that pricing ensures the use of the principles of cost accounting, if prices enable enterprises to work on the principles of self-support [samookupayemost] and self-financing. However, such a simplified understanding leads only to an increase of prices as expenditures increase, which is also responsible for their expenditure nature. The overstatement of prices, which is based on the expenditure approach, conceals the shortcomings in the technology and organization of production and gives rise to contempt for the search for efficient means of managing the economy.

Current prices are also hindering the introduction of full cost accounting in the respect that they do not make it possible to use extensively uniform and stable economic standards. Many fund-forming indicators, which have been calculated on the basis of prevailing prices, are not adequate gauges of the end results and the contribution of labor collectives. In reality the connection of prices with cost accounting consists in the fact that the ratio of prices and the levels of profitability in them would reflect the social utility and scarcity of a product, its quality and technical level. Today a more profitable product is also far from always more necessary, and often it is even just the opposite. Prices do not always make it possible to plan production and economic relations, for the cost accounting interests of enterprises differ from national interests and are the cause of the appearance of negative stimuli in the economy.

Being based on current costs, prices do not take into account the degree of scarcity of items and the urgency of the needs for them. The structural imbalance of supply and demand is the result. The policy of retail prices is one of the most important components of the implementation of the socialist principle of distribution according to labor, meanwhile in practice it is weakly linked with the policy of revenues and with commodity supply.

The conducting of the economic experiment showed that it is necessary to establish such ratios of prices, which would reflect the socially necessary expenditures of labor and the comparative social utility of products; to expand the practice of using contract prices and at the same time to develop a reliable system of the checking of the validity of contract prices with the imposition of strict sanctions in case of the violation of established regulations; to turn prices into an effective lever of scientific and technical progress, for which one should not only increase the prices for new items with allowance made for the impact, but also decrease the prices for products subject to the phase of the life cycle.

"The price," M.S. Gorbachev noted at the June (1987) CPSU Central Committee Plenum, "should play an important stimulating role in the improvement of the use of resources, the decrease of expenditures, the increase of product quality, the acceleration of scientific and technical progress, and the rationalization of the entire system of distribution and consumption." At the June (1987) CPSU Central Committee Plenum the decision was made on the carrying out of the reform of wholesale and retail prices as a component of the improvement of the economic mechanism and the system of management of the national economy.

The reform of pricing is closely connected with the restructuring of material and technical supply. The changeover to wholesale trade in means of production should become the main direction, and the forms here can be most different—direct relations of the supplier and the consumer, cost accounting wholesale bases. The changeover to wholesale trade at present is taking the first steps, it is necessary, having intensified the scale, to complete it in the next few years.

The changeover to wholesale trade will contribute to the normalization of the reserves of commodity stocks. At present the reserves in just the basic sectors of the production sphere come for the country to more than 300 billion rubles.[6] For the most part this situation is explained by the complex and inefficient system of material and technical supply and its unreliability, which also leads to the creation of above-standard reserves. That is why wholesale trade should become the stimulus which will contribute to the reduction of the surpluses of reserves and the elimination of the shortage. Moreover, the opportunity to acquire for the earned money everything, which is required for the output of products, construction and renovation, and the solution of social problems, should be afforded to enterprises.

Today the accomplishment of intensification on the basis of the significant acceleration of scientific and technical progress has become the main guideline in the development of the national economy of the country. "By using extensively the achievements of the scientific and technical revolution and by bringing the forms of socialist management in line with the present conditions and needs, we should achieve the substantial acceleration of socioeconomic development. There is no other way,"[7] it was indicated at the April (1985) CPSU Central Committee Plenum. It should be stressed that scientific and technical progress and the improvement of the management of the economy as decisive factors of its intensive development are inseparably interconnected and have a direct influence on each other.

The planning of new equipment and capital investments, as well as the evaluation of the results of this work at enterprises are being carried out in conformity with unified procedural instructions, which require, of course, certain improvement. However, not so much the imperfection of the methods of the efficiency of new equipment as the lack of the fundamental unity of the indicators of the efficiency of new equipment and capital investments subject to the evaluation indicators of the functioning of the corresponding unit of production (the ministry, production association, enterprise, shop, and so on) is the basic shortcoming of the process of introducing new equipment. In conformity with this uncoordinated systems of material stimulation also exist: in accordance with the results of production operations and for the introduction of new equipment. Such a situation leads to the occurrence of contradictions in the need for the fulfillment of the plan of production and the introduction of new equipment, while the latter often acts as an end in itself, which is poorly connected with production operations. Therefore, the closer linking of the results of production operations with the process of introducing new equipment and the substantial increase of the material interest of the collectives of enterprises in the increase of the efficiency of production, of which, along with others, new equipment is a factor, are necessary. Several fundamental questions of the acceleration of scientific and technical progress have not been settled. The system of planning, the evaluation of activity, and stimulation is still oriented toward the achievement of the current annual results, which weakens the interest of collectives in the assimilation and introduction of the achievements of scientific and technical progress. Many plants of the republic in 1986 did not fulfill the plan of the placement of fixed capital into operation, which is arousing serious apprehension, since the replacement and additional placement of fixed capital into production are one of the most important factors of the long-range assurance of the increase of production efficiency.

The conditions of the experiment and the new methods of work envisaged the increase of role of the production development fund (FRP) in the modernization and retooling of enterprises, but the problems of its functioning, which also existed prior to the experiment, have not been completely solved: its amounts are set too low and inadequate, the standard of the deduction of assets for the production development fund is groundless, the use of assets of the fund for the financing of centralized capital investments is occurring. The establishment at the start of the experiment of common standards of deductions for the production development fund for all enterprises, regardless of their technical level, placed enterprises under unequal conditions.

In order for enterprises and production associations, which are operating under the conditions of the new methods of management, to implement the given right and duty to carry out retooling by means of internal working capital, it is advisable to implement the following measures: to specify the prevailing norms of amortization and to increase significantly the proportion of renovation deductions, which are accumulated in the production development fund, with the leaving at the disposal of associations (enterprises) of up to 100 percent of these deductions, subject to the need for special-purpose assets; to develop a scale, in accordance with which the percentage of amortization deductions, which are channeled into the production development fund, would be differentiated subject to the age composition of the production equipment and the optimum pace of the updating of output and the technology of its production; to channel into the production development fund all the assets of the amortization fund, which are intended for the capital repair and modernization of equipment; to form the centralized portion of the production development fund of the association by deductions from all sources of assets of the fund (and not only with respect to renovation deductions), the specific amounts of which would be specified by the associations themselves.

The USSR Law on the State Enterprise (Association) broadens the rights of the enterprises, which are changing over to the conditions of self-financing with respect to the modernization of enterprises. By means of the profit, which is left to the enterprise, it carries out independent retooling, improves technological processes, and improves the quality of the output being produced.

The increase of the influence of the economic mechanism on the assimilation of the production of new equipment will make it possible to realize more completely the advantages of the socialist mode of production and to accelerate scientific and technical progress, which will contribute to the successful accomplishment of the tasks and the fulfillment of the plan assignments, which are outlined by the Basic Direction of USSR Economic and Social Development for 1986-1990 and the Period to 2000.

The dissemination of the initiative of the Leningrad Party Organization on the improvement of the use of the production potential, the increase of the shift coefficient of machines and equipment, and the increase of the pace of the retooling and modernization of operating production has an important role in the improvement of the economic mechanism. As of 10 November 1986 the first 17 enterprises of Riga changed over to multishift operation. In 1987 the changeover of industry of Latvia to two- and three-shift operation has to be completed in practice. For precisely multishift operation will make it possible to use highly efficient equipment with the maximum load, since at times it is utilized less than ordinary machine tools. Owing to this for the republic the shift coefficient will increase to 1.75, more than 8,600 machines tools and over 53,000 square meters will be freed; the capital investments in production construction will be reduced by a third, and, perhaps, even more, the opportunity will appear to channel the additional assets into the acceleration of housing construction and the further development of the social infrastructure. The Law of the Union of Soviet Socialist Republics on the State Enterprise (Association), which increases substantially the possibilities of the participation of labor collectives in the efficient use of the assets of the enterprise, envisages the further strengthening of the economic methods of management and the use of full cost accounting and self-financing, and specifies the relations between enterprises (associations) and state authorities and management organs, takes effect on 1 January 1988.

The results of the economic experiment and work under the new conditions of management showed the means of solving many problems, but also gave rise to questions and problems, the answers to which in the future will will developed under the new conditions of management and will contribute to the adjustment of the economic mechanism in conformity with the goals and tasks, which have been set by the party and government for the national economy of the country.

Footnotes

1. V.I. Lenin, "Poln. sobr. soch." [Complete Works], Vol 38, p 138.

2. "Materialy iyunogo (1987 g.) Plenuma TsK KPSS" [Materials of the June (1987) CPSU Central Committee Plenum], Moscow, Politizdat, 1987, p 38.

3. "Materialy iyunogo (1987 g.) Plenuma TsK KPSS," p 57.

4. See *Planovoye Khozyaystvo*, No 1, 1985, p 38.

5. See "Materialy iyunogo (1987 g.) Plenuma TsK KPSS," p 54.

6. "Materialy iyunogo (1987 g.) Plenuma TsK KPSS," p 56.

7. "Materialy aprelskogo (1985 g.) Plenuma TsK KPSS" [Materials of the April (1985) CPSU Central Committee Plenum], Moscow, Politizdat, 1985, p 8.

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Achievements of Regional Academic Science

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[Article by Candidate of Technical Sciences A.A. Buryak and Candidate of Technical Sciences N.S. Pshirkov under the rubric "Scientific and Technical Progress: Problems of Acceleration": "Regional Academic Science and the Acceleration of Scientific and Technical Progress"]

[Text] The 27th CPSU Congress devoted much attention to the further increase of the efficiency and quality of scientific research, the acceleration of the introduction of its results in practice, the improvement of the forms of the contact of science with production, and the improvement of the system of the management of scientific research and planning and design organizations. In this connection during the 12th Five-Year Plan great tasks also face regional academic science—the republic academies of sciences and the departments, scientific centers, and affiliates of the USSR Academy of Sciences. The guarantee of the successful accomplishment of these tasks is the significant results of basic and applied research, which were obtained by creative collectives during the years of the 11th Five-Year Plan. A number of important results will be listed below. As to the introduction of these results, at present the most different

forms of the contact of academic science with production, which conform to the greatest degree to the peculiarities and the needs of the development of the national economy of the republics and individual regions, have been specified and have undergone checking in practice.

Here one should name such forms as the performance of joint work with sectorial ministries on the basis of comprehensive plans and long-term programs, research in the interests of large production associations and enterprises of the country in accordance with comprehensive scientific and technical programs, the organization of work in accordance with decrees of directive organs, the establishment of sectorial interdepartmental laboratories and interdepartmental and academic scientific and technical complexes and associations, the conclusion of contracts on socialist cooperation with enterprises, and the solution of regional problems by academic scientific institutions.

Now practically all the republic academies and the scientific centers and affiliates of the USSR Academy of Sciences are participating in the fulfillment of scientific and technical programs which were approved by the USSR State Committee for Science and Technology. Such an effective form of the integration of science with production as the joint work of the academies of sciences of the union republics with union and republic sectorial ministries in accordance with comprehensive plans and long-term programs is also being used extensively.

Thus, for example, the Ukrainian SSR Academy of Sciences drafted and approved for the current five-year plan 19 plans of joint work with the USSR Ministry of Nonferrous Metallurgy, the USSR Ministry of Construction of Petroleum and Gas Industry Enterprises, the USSR Ministry of the Chemical Industry, the USSR Ministry of the Gas Industry, and the USSR Ministry of the Communications Equipment Industry, as well as with the Ukrainian SSR Ministry of Power and Electrification, the Ukrainian SSR Ministry of Geology, and others. Moreover, nine joint programs of the Ukrainian SSR Academy of Sciences and the Ukrainian SSR Ministry of Higher and Secondary Specialized Education on research in the field of cybernetics, material science, physical instrument making, geology, and chemistry were formulated and approved for the 12th Five-Year Plan.

Scientists of the Institute of Cybernetics imeni V.M. Glushkov developed mathematical principles of the designing of fifth-generation computers, which do not have analogs in world practice and made it possible to develop a unique multiprocessor complex with a speed of more than 100 million operations a second.

On the basis of the results of the study of the physical chemical processes of the vaporization and condensation of substances in a vacuum scientists of the Institute of Electric Welding imeni Ye.O. Paton developed a highly efficient electron beam technology of the working of various materials, which made it possible to carry out the radical reorganization of works in a number of sectors of industry. A new technology of the resistance welding of parts by the method of pulsing flashing, which ensures the great strength of welded joints and shortens the welding time to one-third to one-half as compared with the traditional resistance method, was developed at the same institute.

Biologists of the Ukrainian SSR Academy of Sciences on the basis of basic research in the field of the cell and genetic engineering of plants developed technologies of obtaining stock material for the selection of new strains of agricultural crops.

During the years of the 11th Five-Year Plan more than 7,500 developments of the Ukrainian SSR Academy of Sciences were introduced in the national economy of the country, while its share in the total economic impact from their introduction came to more than 3 billion rubles.

The institutions of the Belorussian SSR Academy of Sciences during the 12th Five-Year Plan are participating in the implementation of 38 union and 27 republic scientific and technical and economic programs. At the academy research is being conducted in accordance with long-term program agreements with ministries, departments, and large production associations. Thus, programs of joint work with the union ministries of the electronics, aviation, chemical, and radio industries have been approved.

Scientists of the Institute of Solid State and Semiconductor Physics synthesized superhard materials of the Elbor-RN and Belbor brands, which have been introduced at enterprises of the USSR Ministry of the Machine Tool and Tool Building Industry. New highly efficient technologies of metal working were developed at the Physical Technical Institute. Scientists of the Institute of Technical Cybernetics developed a software and hardware complex of the computer-aided designing, engineering, and technological preparation of the production of parts in machine building. More than 30 types of instruments and devices for the nondestructive testing of product quality were developed at the Institute of Applied Physics.

The basic research of the Institute of Bioorganic Chemistry on protein-ligand interaction made it possible to propose effective methods of distinguishing the proteins which bond all the most important steroid hormones. On this basis 11 types of domestic medical sets of reagents for radioimmunological microanalysis were developed and assimilated by pilot production. Technologies of obtaining the liquid fodder product Promiks and the dry fodder product Provilakt, which are being used as protein-vitamin additives in the fattening of hogs, were developed at the Institute of Microbiology by means of microbe synthesis in whey.

At the Moldavian SSR Academy of Sciences research and the coordination of work in accordance with 15 republic intersectorial scientific and technical programs are presently being carried out. During the 11th Five-Year Plan joint research and the introduction of its results were carried out in accordance with programs of scientific and technical cooperation with the Moldavian SSR Ministry of Motor Transport, the Moldavian SSR Ministry of the Food Industry, the Moldavian SSR Ministry of Land Reclamation and Water Resources, the Moldavian SSR State Committee for the Supply of Production Equipment for Agriculture, and others. On the basis of work in the field of semiconductor physics, semiconductor microelectronics, and optoelectronics at the Institute of Applied Physics of the Moldavian SSR Academy of Sciences original instruments were developed: a remote temperature gauge, a digital thermoelectric vacuum gauge, and a set of sensors for biological research.

Technological processes and technological means for the machining of metallic materials by the methods of electric spark and electrolytic alloying, electroplates, and electrochemical dimensional machining are being successfully developed.

The Plazmoliz unit for the electrical processing of apples, grapes, and tomatoes, which ensures an increase of the yield of juice on the average by 3-5 percent and an increase of the capacity of production lines for the production of tomato paste by 12 percent, was developed.

The research on the development of the biological principles of the increase of agricultural production, resource conservation, and nature protection, as well as on the assurance of the keeping capacity and efficient use of the obtained produce is of the greatest importance for the agroindustrial complex of the republic and the implementation of the Food Program.

The Far Eastern Scientific Center (now the Far Eastern Department) of the USSR Academy of Sciences prepared for the 12th Five-Year Plan 20 comprehensive interdepartmental programs on the most important problems of the development of the productive forces of the Far East. Among them are "The Presence of Petroleum and Gas in Far Eastern Land Locked Seas" and "The Forecast of Solid Minerals in the Far East" programs. A contract on creative cooperation between the Far Eastern Department and the RSFSR Ministry of Geology was concluded, a joint order of the USSR Ministry of Nonferrous Metallurgy and the Far Eastern Department on scientific and technical cooperation for the current five-year plan was signed.

On the basis of research in the field of advanced computer hardware and programming technology the first regional oceanographic data bank in the country for the Pacific and Indian oceans, a software and hardware complex for the receipt and processing of satellite information, and others were developed and placed into operation at the Far Eastern Department.

At the Institute of Chemistry a technology of applying protective coatings to items of ship machine building made of metals and alloys, which substantially improve their corrosion resistance, was developed and is being introduced. New light-transforming film materials were developed for agriculture.

The Pacific Ocean Institute of Bioorganic Chemistry of the Far Eastern Department studied the structure and physiological activity of a number of low-molecular biological regulators of marine organisms, among which compounds, which are promising for use in medicine, agriculture, and other fields, were discovered. Means of obtaining several of these compounds were developed. Studies of the biological resources of the shelf of the Far Eastern seas and the coastal waters of Vietnam were conducted.

In the field of oceanology important results on the study of the hydrophysical and dynamic characteristics of various structural zones of the ocean were obtained, the scientific methods basis of the system of the observation and monitoring of the state of the ocean in the interests of the weather service and the fishing and maritime fleet of the country was developed. Geological scientists of the Far Eastern Department determined the prospects of the presence of petroleum and gas in the shelf zones of Far Eastern seas ar[illegible] are carrying out the formulation of the scientific principles of the geological and geophysical prospecting of large deposits of nonferrous and precious metals.

Such a form of integration as the performance of work in the interests of large production associations and enterprises of the country in accordance with comprehensive scientific and technical programs became most widespread at practically all the republic academies of sciences and the scientific centers and affiliates of the USSR Academy of Sciences. In particular, the Ukrainian SSR Academy of Sciences is successfully cooperating with the Moscow Motor Vehicle Works imeni I.A. Likhachev (the ZIL Production Association), the Krivoy Rog Mining and Ore Dressing Combine, the Artemugoal Association, and others.

Scientific institutions of the Belorussian SSR Academy of Sciences are performing joint work in accordance with programs with the BelavtoMAZ, Gomelmash, and Minskiy traktornyy zavod imeni V.I. Lenina production associations.

The Kazakh SSR Academy of Sciences is cooperating with production associations of the Kazakh SSR Ministry of Nonferrous Metallurgy, the Kazakh SSR Ministry of Geology, and the Kazakh SSR Ministry of Higher and Secondary Specialized Education. Scientists developed mathematical models and algorithms for the solution of

problems of heat and mass exchange, which made it possible to develop a new class of circuit breakers with increased technical and economic indicators. New designs of industrial manipulators with expanded functional possibilities were developed on the basis of research in the field of the structural, kinematic, and dynamic analysis and synthesis of mechanisms of high classes.

At the Institute of Chemical Sciences important results on the chemistry and technology of the production of phosphorus and compound fertilizers on the basis of the phosphorites of Karatau were obtained. A number of technologies of the waste-free processing of raw materials and waste products of nonferrous metallurgy were developed and introduced. At the Institute of Organic Catalysis and Electrochemistry the basic principles of the theory of catalytic hydrogenation were developed, methods of obtaining resource-saving catalysts of the selective hydrogenation of polyunsaturated compounds were proposed, a number of important questions, which are connected with the recovery of carbon monoxide and the removal of carbon monoxide, nitrogen oxide, and organic compounds from industrial waste gases and the exhaust of motor transport, were settled, and technologies of obtaining ultrapure metals were developed.

Microbiologists and virologists of the Kazakh SSR Academy of Sciences were the first to establish the virus-inhibiting properties of roseofungin with respect to the influenza virus type A and influenza virus type B, as well as other diseases.

At the Latvian SSR Academy of Sciences scientists of the Institute of Inorganic Chemistry developed a technology of the plasma application of new wear-resistant, corrosion-proof, and heat-resistant coatings for the purpose of the reconditioning and strengthening of parts of agricultural equipment, motor transport, and other machines and devices. Six sections for the plasma application of coatings were organized at enterprises of the Latvian SSR.

Scientists of the Institute of Organic Synthesis cloned the genes of human leukocyte (alpha) interferon, among which two new types were discovered and studied. New drugs, of which 11 are already undergoing clinical tests, were developed on the basis of basic research in the field of organic chemistry, physical chemical biology, and biotechnology. Production and state tests of 12 new preparations for the needs of agriculture have been started.

Scientists of the Estonian SSR Academy of Sciences synthesized and tested several tens of biologically active compounds—means of controlling harmful insects—juvenoids and pheromones. A number of obtained preparations were turned over for state tests.

At the Azerbaijan SSR Academy of Sciences structural tectonic and geochemical criteria of estimating the prospects of the presence of petroleum and gas in Holocene-Myocene formations were proposed; the use of these criteria helped to discover new deposits of petroleum and gas.

The technology of producing flexible nonmetallic pipes on the basis of fiber glass, which was developed by Azerbaijan scientists, is very promising. New brands of steels, which do not contain tungsten and have a reduced amount of molybdenum, were obtained; in properties they are not inferior to standard high-speed steels, but are one-half to two-third as expensive as them.

At the Georgian SSR Academy of Sciences the collective of the Institute of Mechanics imeni G.I. Tsulukidze jointly with sectorial organizations developed a mechanized complex which sharply increases labor productivity in the extraction of solid minerals. The Institute of Metallurgy imeni 50-letiya SSSR jointly with the Rustavi Metallurgical Plant proposed an original industrial technology of treating molten steel in the ladle with inert gases, as a result of which the chemical and temperature uniformity of the molten metal and, consequently, the quality of the finished product increase.

At the Institute of Physical and Organic Chemistry imeni P.G. Melikishvili a process of obtaining organozeolite fertilizer of prolonged action was developed and a unit for its production was devised. The use of the new fertilizer increases substantially the yield of many agricultural crops.

At the Ural Scientific Center (now a department of the USSR Academy of Sciences) scientists of the Institute of Chemistry developed fundamentally new materials—tungsten-free hard alloys based on titanium carbonitride. They have been introduced at more than 300 enterprises with a significant economic impact. At the Institute of Metal Physics methods of strengthening alloys, on the basis of which new contact materials were developed, were studied.

It is necessary to note a number of achievements in the field of computer technology, instrument making, and automation.

At the Lithuanian SSR Academy of Sciences the Institute of Electronics and Computer Technology jointly with other organizations developed an experimental computer network of the USSR Academy of Sciences and the academies of sciences of the union republics (Akademset). Groups of computers of scientific institutions of Moscow, Leningrad, Tallinn, Riga, Vilnius, Minsk, Kiev, Sverdlovsk, Novosibirsk, Khabarovsk, and Tashkent are already linked with each other.

At the Lithuanian SSR Academy of Sciences scientists of the Institute of Physics developed a monopulse picosecond laser, which in its technical specifications surpasses

world models. Biochemical scientists studied oxidoreducing reactions of proteins and enzymes, which had been absorbed on conducting matrices. As a result the Eksan-6 enzymatic analyzer, which has been recommended for series production, was developed.

At the Estonian SSR Academy of Sciences a method of the holographic recording of information, which affords fundamentally new prospects of the development of computer memory devices which substantially exceed the possibilities of magnetic recording, was proposed and implemented experimentally at the Institute of Physics. The discovery by scientists of the Institute of Physics of a new phenomenon—the hot luminescence of crystals—made it possible to solve the fundamental problem of classifying the secondary glow of crystals. The small-series production of a laser pulse spectrometer, which has found application at a number of institutes of the country and abroad, was developed and adjusted.

At the Armenian SSR Academy of Sciences a series of instruments for the automation of the most important technological process in nonferrous metallurgy—flotation—was developed and is being successfully introduced in production. The series production of these instruments for enterprises of nonferrous metallurgy was organized.

At the Special Design Bureau of Scientific Instrument Making of the Georgian SSR Academy of Sciences a set of devices for the automation of preclinical pharmacological studies of new drugs was developed.

At the Kola Affiliate imeni S.M. Kirov of the USSR Academy of Sciences the Mining Institute and the Polar Geophysics Institute in an underground mine of the Apatit Production Association introduced an automated system of the continuous monitoring and forecasting of the state of the rock mass.

Another widespread form of the contact of science with industry is sectorial and intersectorial problem laboratories, the activity of which is helping to strengthen the creative contacts of scientists and production workers and to increase the influence of academic institutes on sectors and their enterprises. These laboratories are established either on the basis of an academic institute or on the basis of a sectorial institute or enterprise. Such laboratories have been established and are successfully operating in the Ukraine, Belorussia, Uzbekistan, Kazakhstan, Latvia, Moldavia, Leningrad, and the Urals.

The establishment in the system of the Ukrainian SSR Academy of Sciences of special problem-oriented subdivisions—engineering centers—was a qualitatively new step in the matter of the quickest practical implementation of innovative developments. Their task is the acceleration of development and the assurance of the large-scale introduction and highly efficient use in the national economy of new advanced technologies, materials, equipment, and automated control systems. Engineering centers have been organized within large scientific institutions of the Ukrainian SSR Academy of Sciences, which hold a leading position in the country in a specific scientific and technical direction and have a sufficiently developed design, technological, and pilot production base. At present nine such centers are operating successfully at the Ukrainian SSR Academy of Sciences.

At the Belorussian SSR Academy of Sciences scientific engineering centers were established at the Physical Technical Institute (plastic metal working), the Institute of Technical Cybernetics (computer-aided design in machine building), and the Institute of Problems of the Reliability and Durability of Machines (the speeding up of the reliability test of parts of machines and assemblies).

Since 1985 two engineering centers, which were organized at the Mikond Production Association and the Tashkent Motor Plant, have been operating in the system of the Uzbek SSR Academy of Sciences.

Such a new form of the contact of science with production as interbranch scientific technical complexes (MNTK's) has been finding greater and greater dissemination.

Two such complexes—the Institut elektrosvarki and the Poroshkovaya metallurgiya complexes—were organized respectively on the basis of the Institute of Electric Welding imeni Ye.O. Paton and the Institute of Problems of Material Science of the Ukrainian SSR Academy of Sciences. Institutions of the Latvian SSR Academy of Sciences are participating in the work of two union interbranch scientific technical complexes: the Institute of Organic Synthesis with an experimental plant has been included in the Biogen Interbranch Scientific Technical Complex, while the Institute of Inorganic Chemistry with an experimental design and technological bureau has been included in the Antikor Interbranch Scientific Technical Complex.

The search for the most effective forms of the integration of academic, sectorial, and VUZ science with production associations and enterprises, with allowance made for the peculiarities of the development of republics and regions, led in a number of union republics to the establishment, on the initiative of the academies of sciences, of republic interbranch scientific technical complexes (the Uzbek SSR, the Azerbaijan SSR, the Latvian SSR). Thus, for example, there are being established in the system of the Moldavian SSR Academy of Sciences a scientific technical center for the electrophysical machining of the surface of metals on the basis of laboratories of the Institute of Applied Physics and its pilot plant, chairs of Kishinev Polytechnical Institute imeni S. Lazo, and industrial enterprises of the republic;

a scientific technical center for optoelectronic materials and instruments; an interdepartmental scientific production association of gamete and cell selection, and so on.

Such an organizational form as temporary joint creative collectives of academic institutions, sectorial scientific research institutes, and higher educational institutions of the country, which are established for the rapid elaboration of specific problems and the quick introduction of the results in production, is spreading. Seven such collectives are already working at the Ukrainian SSR Academy of Sciences and the Georgian SSR Academy of Sciences, their establishment is also planned at a number of other academies of the union republics and affiliates of the USSR Academy of Sciences (the Kazakh SSR Academy of Sciences, the Komi Affiliate, and others).

At the Turkmen SSR Academy of Sciences considerable work is being performed in the interests of the Central Asian Region, particularly on the use of solar energy in the national economy. The collective of the Solntse Scientific Production Association of the Turkmen SSR Academy of Sciences developed solar systems of hot water supply, refrigeration supply, and the drying of agricultural products and units for the production of biogas from the waste products of animal husbandry. In accordance with developments of the academy the construction of a plant of dry chlorella is being carried out and the construction of the first autonomous solar energy complex for livestock breeding farms of desert territories is being completed.

The Institute of Deserts provided practical recommendations on the efficient management of agriculture on arid lands. Original methods of the enrichment of desert pastures were developed, the means of the stabilization and afforestation of moving sands, the water supply of desert territories, and so on were improved. Scientists of the Institute of Physiology and Experimental Pathology of the Arid Zone formulated biomedical recommendations on the support of the labor of workers of industrial and agricultural enterprises under arid conditions and developed new methods and equipment of the clinical diagnosis and monitoring of pathological changes in case of a number of diseases of the cardiovascular system.

At the Tajik SSR Academy of Sciences within the framework of the implementation of the Food Program scientists introduced in production more than 20 scientific developments. Considerable attention is being devoted to the improvement of the technique of furrow irrigation on territories with structurally unstable loess soils, to the optimum management of irrigation systems, and to the regulation of the water-salt regime of fruitful lands. Research is being conducted in the field of the earthquake-proof construction of dams and irrigation facilities. Developments of the academy on the protection of cotton and fruit crops against pests and diseases on the basis of the use of biological waste products are being successfully used in the republic.

The experience of the Ukrainian SSR Academy of Sciences (the Western Scientific Center) in the establishment of interdepartmental special-purpose scientific production associations as a public service gave a positive account of itself. Their task is the concentration of the efforts of scientific institutions, higher educational institutions, and production organizations of the region for the increase of the level of designing, technology, and management at individual or several related enterprises. The activity of such associations is regulated by a contract on cooperation and by a statute, which has been approved by the appropriate ministries and departments. Another form of the contact of science with production, which originated at the Ukrainian SSR Academy of Sciences, is the conducting of joint work of this academy with enterprises and organizations of one or another administrative rayon of the republic in accordance with a long-range comprehensive scientific, technical, and socioeconomic program. The guiding role of party and soviet organs of the corresponding region in the activity on the fulfillment of comprehensive goal programs is a peculiarity of these forms of the organization of joint work. Similar programs are being implemented in Belorussia and Moldavia.

Academic institutions are striving to carry out the introduction of the results of scientific developments on the basis of the establishment of their own developed pilot industrial base.

In recent years the material and technical base and the pilot production base of the republic academies of sciences and the scientific centers and affiliates of the USSR Academy of Sciences continued to be strengthened. First of all it is also necessary to note here the Ukrainian SSR Academy of Sciences, the development of which during recent five-year plans was characterized by the leading growth rate of pilot production enterprises and subdivisions. By early 1986 the pilot production base of the Ukrainian SSR Academy of Sciences consisted of 78 cost accounting organizations, including 10 pilot plants, 29 pilot and experimental works, 32 design bureaus, 5 computer centers, and 2 seismological parties. The total amount of work, which was being performed by these organizations in 1986, exceeded 235 million rubles, including the production of new instruments worth 22 million rubles. The total number of personnel of the pilot production subdivisions came to nearly 40,000. During the years of the 11th Five-Year Plan 41 million rubles were allocated for the expansion and strengthening of the material and technical base of cost accounting enterprises. New pilot production capacities were placed into operation at a number of institutes of the academy, two pilot plants, five pilot works, and six design bureaus were established.

During the past two five-year plans the pilot experimental base of the Belorussian SSR Academy of Sciences, which now has within it 14 different organizations, also

grew significantly. Particular attention has been devoted during the current five-year plan to the updating of the machine tool pool of pilot works.

During the current five-year plan more than 85 million rubles have been allocated for the strengthening of the material, technical, and experimental production base of the Uzbek SSR Academy of Sciences. The situation with the placement of fixed capital into operation, which during 1981-1985 came on the average to 42 percent and in 1985 to 17.8 percent, is poor. The Uzbek SSR Academy of Sciences prepared and sent to directive organs of the republic suggestions on the development and further strengthening of the pilot experimental base during the 12th Five-Year Plan.

At the Azerbaijan SSR Academy of Sciences the construction of a pilot base for the Kristall Special Design and Technological Bureau, the Selen Pilot Plant, and a number of institutes is envisaged during the 12th Five-Year Plan. Jointly with the republic State Planning Committee in such sectors as the petrochemical and petroleum refining sectors the base enterprises for the pilot industrial checking of developments of scientists of the Azerbaijan SSR Academy of Sciences are being specified.

A particularly favorable situation for the development of the pilot experimental base formed at the Moldavian SSR Academy of Sciences. The increase of the placement of fixed capital into operation during the 11th Five-Year Plan was boosted as compared with the 10th Five-Year Plan by 2.4-fold. For the 12th Five-Year Plan an increase of the placement of fixed capital into operation as compared with the 11th Five-Year Plan by more than twofold is planned for the Moldavian SSR Academy of Sciences.

However, at the majority of academies of sciences and scientific centers and affiliates of the USSR Academy of Sciences the state of the pilot experimental base does not satisfy present requirements. There is an urgent lack of work areas, the percentage of obsolete equipment is significant. The plans of capital construction of facilities of science are systematically not being fulfilled. At the Turkmen SSR Academy of Sciences and the Dagestan Affiliate pilot experimental bases in practice have not been developed.

The development of more effective forms and methods of the management of scientific and technical progress itself at the union, republic, and regional levels, particularly methods of the planning and coordination of scientific activity, is becoming an essential factor of the acceleration of scientific and technical progress of the country. In many union and autonomous republics, krays, and oblasts councils for the promotion of scientific and technical progress attached to the central committees of the Communist Parties of the republics, kray committees, and oblast committees, in the work of which republic academies and the scientific centers and affiliates of the USSR Academy of Sciences are taking a direct part, have been established and are operating successfully.

Along with this the academies of sciences themselves are performing some work on the management of scientific and technical progress and on the coordination of research on the scale of republic and regions on important national economic problems.

The councils for the coordination of scientific activity of the republic academies, as well as their scientific councils, which participate in the formulation of the research themes of academic institutions, are called upon to play a significant role in the coordination of scientific research on the natural, technical, and social sciences.

Scientific and technical programs of different levels are an important form of the coordination of the work that is being performed at institutions and organizations of various departments.

The presidiums of the academies of sciences of the union republics and of the scientific centers and affiliates of the USSR Academy of Sciences, in attaching great importance to the increase of the role of academic science in the acceleration of scientific and technical progress, are formulating measures on the further intensification of research in priority directions and in directions, which are being most successfully developed at them, and on the development on their basis of fundamentally new technologies, materials, machines, equipment, and instruments. Thus, at the Ukrainian SSR Academy of Sciences the directions of the work on the development of new advanced technologies during the 12th Five-Year Plan and the list of most important technologies, which were developed at the academy during the 11th Five-Year Plan and are liable to large-scale introduction during the 12th Five-Year Plan, have been approved.

Considerable attention is being devoted at the Ukrainian SSR Academy of Sciences to the coordination of the efforts of its institutions and organizations on the fulfillment of the assignments of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000.

At the Ukrainian SSR Academy of Sciences scientific centers, which encompass by their activity several adjacent oblasts of the republic, have also been established. They are interdepartmental scientific coordinating organs, which unite and concentrate the efforts of various departments on the solution of urgent problems of the economic and social development of the region. One of the basic directions of this activity is the organization of work in accordance with contracts on scientific and technical cooperation of the Ukrainian SSR Academy of Sciences with the oblasts of the republic and Kiev.

It is natural that in the activity on the integration of science and production and on the management of scientific and technical progress other forms, which take into account to the greatest degree the peculiarities of the local development of republics, regions, krays, and oblasts, may also be found.

It should be acknowledged that for the present, despite specific achievements in the indicated area, the proportion of purposeful comprehensive research and development on problems of an intersectorial nature and a regional and republic scale is very small. Inadequate attention is still being devoted to scientific research on the Food and Energy Programs. At a number of academies of sciences of the union republics (the Kazakh SSR Academy of Sciences, the Georgian SSR Academy of Sciences, the Azerbaijan SSR Academy of Sciences, the Armenian SSR Academy of Sciences, and others) and scientific centers and affiliates of the USSR Academy of Sciences research in the field of power engineering and energy-saving technologies in practice is not being conducted. The work of the academies of sciences of the republics of Central Asia and Kazakhstan on the commitment to the fuel and power balance of the country of alternative energy sources, particularly on the development of plants for the utilization of solar and geothermal energy, is being poorly integrated. In practice this work is also not being performed at the Azerbaijan SSR, Georgian SSR, and Armenian SSR academies of sciences and at the Dagestan Affiliate of the USSR Academy of Sciences. Finally, at the academies of sciences of the republics of Central Asia, Kazakhstan, and Transcaucasia entirely inadequate attention is being devoted to research and the development of practical recommendations on water and land problems.

Thus, the republic academies of sciences and the scientific centers and affiliates of the USSR Academy of Sciences for their most part have not yet become effective science-coordinating centers in the republics, which are capable of uniting the efforts of academic institutions and institutes and organizations of various departments for the solution first of all of the most important problems of a regional and republic nature.

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Marchuk on Vilnius Session of Coordinating Council

18140100 Vilnius SOVETSKAYA LITVA in Russian 27 Oct 87 p 2

[Interview with President of the USSR Academy of Sciences Academician Guriy Ivanovich Marchuk, Hero of Socialist Labor and winner of the Lenin and USSR State Prizes, by ELTA correspondent Romualdas Chesna: "An Important Lever of Acceleration"; first two paragraphs are *Sovetskaya Litva* introduction]

[Text] A field session of the Council for the Coordination of the Activity of the Academies of Sciences attached to the Presidium of the USSR Academy of Sciences, which discussed the restructuring of the academies of sciences of the union republics and the regional departments and affiliates of the USSR Academy of Sciences in light of the decisions of the 27th CPSU Congress and recent CPSU Central Committee plenums, was held in Vilnius. The session participants—executives of the USSR Academy of Sciences and prominent scientists—familiarized themselves with the activity of the institutes of the Lithuanian SSR Academy of Sciences and visited Kaunas Polytechnical Institute imeni Antanas Snechkus, the medical institute, and the Sigma Association.

ELTA corresponding Romualdas Chesna addressed to President of the USSR Academy of Sciences Academician Guriy Ivanovich Marchuk, Hero of Socialist Labor and winner of the Lenin and USSR State Prizes, the request to comment on the work of the session and on the meetings held in Vilnius.

[Answer] At the session much attention was devoted to the role of academic science in the solution of important problems of scientific and technical progress and to the strengthening of its contact with higher educational institutions and sectorial organizations. At present more than 250 institutes of the academies of sciences of the union republics are participating in the implementation of over 190 republic scientific and technical programs. However, the academic scientific potential is still not being fully utilized. Interbranch scientific technical complexes have not yet become structural units of the national economy, which are capable of accelerating cardinally the process of the development and assimilation in production of highly efficient types of equipment and technology.

The experience of the work on the Lithuanian SSR Academy of Sciences on uniting the efforts of academic, sectorial, and VUZ science for the settlement of the most important questions of scientific and technical progress in the republic was discussed at the session. The academy is successfully implementing a set of measures in this direction, the themes of the research and development being conducted are specified here with allowance made for the specific needs of large enterprises and industrial associations. The Elektronika Scientific Production Complex and the Galvanotekhnika and Lazery scientific production associations, which were organized as a public service and unite about 50 scientific and production collectives, are working creatively. For the purpose of speeding up the introduction of scientific research in the national economy the Lithuanian SSR Academy of Sciences jointly with interested organizations is establishing interdepartmental, as well as temporary scientific and technical laboratories. Regional centers of the Lithuanian SSR Academy of Sciences are being successfully formed in Shyaulyay, Klaypeda, and Kaunas. I want to note the large amount of work that is

being performed in Shyaulyay: here problems of ecology are being successfully solved, closed technological works are being established. Kaunas is becoming a genuine center of precision mechanics and precision machine building: in this sense the very promising direction of vibration engineering is of great importance.

The basic works of the Lithuanian SSR Academy of Sciences in the field of physics, probability theory and mathematical statistics, and biochemistry are significant. Original schools of these fields, which are setting the tone for all domestic science, have been established. We hope that in these directions the Lithuanian SSR Academy of Sciences will successfully coordinate the work on the scale of the entire country.

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Azerbaijan Bioflor Interbranch Complex
18140098 Baku BAKINSKIY RABOCHIY in Russian 24 Oct 87 p 2

[Article under the rubric "Science and Production" (AZERINFORM): "Bioflor Is Acceleration"]

[Text] How is one to shorten the path of a scientific innovation to production? Does the opportunity exist to make scientists and experienced workers allies in the rapid introduction of basic ideas and the results of laboratory research? Interbranch scientific technical complexes—fundamentally new formations, to which along with academic scientific institutes production associations and enterprises belong—are giving an affirmative response to these questions. The Bioflor Complex, of which the Institute of Botany of the Azerbaijan SSR Academy of Sciences is the main organization, is one of five such complexes which have been established in the republic.

The draft of the program of work for 1988-1990 and the future to 2000 was discussed at a meeting of the party and economic aktiv of the Bioflor Republic Interbranch Scientific Technical Complex. The need for more efficient coordination and the increase of the efficiency of the work and the creative return of the organizations belonging to the complex was noted in the report of Corresponding Member of the Azerbaijan SSR Academy of Sciences U.K. Alekperov, director of the Institute of Botany, and in the statements of representatives of the State Agroindustrial Committee, the Ministry of Local Industry, the Ministry of the Forestry Industry, the State Committee on Prices, other ministries and departments, and scientific institutions of the republic.

The meeting participants specified the means of intensifying the work on the use of the abundant local plant resources, the waste products of the agroindustrial complex, and nontraditional crops for the organization of the production of new, including currency-consuming, materials and goods, which do not have analogs in world practice or are intended for the replacement of imported ones.

7807

Restructuring Report By AN KazSSR Department of Physical and Mathematical Sciences
Alma-Ata VESTNIK AKADEMII NAUK KAZAKHSKOY SSR in Russian No 4, Apr 87 pp 14-17

[Article under the heading "In the Presidium of the Kazakh SSR Academy of Sciences": "Scientific and Scientific-Organizational Activity of Institutions of the Kazakh SSR Academy of Sciences' Physics-Mathematics Department During 1986 in Light of the Resolutions of the 27th CPSU Congress and the 16th Congress of the Kazakhstan Communist Party"]

[Text] Reflecting the resolutions of the 27th CPSU Congress and 16th Congress of the Kazakhstan Communist Party, the Department of Physics and Mathematics has worked specifically to intensify scientific research, to review the subject areas and structure of its scientific institutions, to perfect the system for training scientists, and to improve morale and the psychological climate in the collectives.

Five institutes with a total of 1,984 associates, including 35 doctors of sciences, 254 candidates of sciences and 569 scientific workers, function within the department. Some 120 people were in graduate studies [in 1986].

The amount of scientific research of national economic importance increased significantly. Under the Kazakh SSR State Economic and Social Development Plan, 28 projects were carried out in 1986 (four were carried out in 1985), of which 17 were part of eight union-level scientific-technical programs (four in 1985) and 11 were part of five republic scientific-technical programs. In the reporting year as a whole, 67 projects were carried out and two works were completed.

The department held a General Assembly session and 13 department bureau meetings in the reporting year, including one enlarged meeting at which issues of creating good morale and a favorable psycholo_.cal climate in the collectives of scientific institutions were discussed. Department institutes determined promising scientific areas of inquiry of important national economic significance for the period through 1999. However, the IYaF [Institute of Nuclear Physics], as the lead organization and center for radiation and ion-laser research and technologies, did not display the proper activeness, except for initial organizational work.

The organization of temporary branch laboratories was determined to be one way of integrating science and production. The "Ekibastuzset" temporary young-people's creative collective, "Spektroanalit" laboratory and

a temporary, joint IMM [Institute of Mathematics and Mechanics] and Kazakh State University labor collective, "Vyshka Sharnirnaya," are currently being created. Other institutes are also doing similar work on setting up temporary collectives.

Four doctoral and 29 candidates' dissertations were defended in 1986. Plan fulfillment was 88 percent for graduate-student graduation, with a success rate of 32 percent.

[The following were] the basic research results for 1986.

The equivalence of problems of the existence of a recursively axiomizable and fully finitely-aziomizable theory under certain conditions superimposed on a Morley rank was demonstrated. Necessary and sufficient conditions were obtained for the discreteness of a spectrum of general Schroedinger-type operators and for a twp-way estimate of their eigenvalues. Necessary and sufficient conditions for the existence of strong solutions were determined for mixed-type Hellerstadt equations in the angular field in angle terms (IMM).

Single-charge relativistic hypernuclei were discovered in the interactions of carbon and neon nuclei at a momentum of 4.1 GeV/sec per nucleon and it was demonstrated that their free path is considerably less than that of ordinary nuclei of similar mass and energy. Research on the nuclear interactions of cosmic-ray particles at the multipurpose Adron-44 facility recorded a unique event with an energy of 5×10^{15} eV. It consisted of dense beams of charged particles moving from the atmosphere at short distances to one another. It was demonstrated that the implantation of molecular ions can alter the concentration of electrically active defects in crystalline and amorphous silicon in a directed way. New data were obtained on the spatial distribution characteristics of heavy ions with energies of up to 2 MeV per nucleon introduced into silicon (IFVE [Institute of High Energy Physics]).

The mass and energy distributions of [fission] fragments during nuclear fission in the vicinity of lead using light charged particles near the reaction threshold were studied and direct proof was obtained of the existence of "fission valleys" at the strain-energy surface. A new method of irradiation was used to reveal the determining role of contaminant helium in change in the strength coefficient of defects responsible for the radiation strength of metal. The patterns of radiation-stimulated stratification of various atoms in isostructural intermetallic compounds were established. New data were obtained on the radiation creep of metals and three stages of temperature creep were discovered (IYaF).

A new comet, Churyumov-Solodovnikov, and four new Herbing-Aro objects were discovered (AI [probably: Astrophysics Institute]).

A high-altitude neutron supermonitor was used to record proton flux from solar flares. Complex experiments were conducted to study solar terminator wave turbulence in the middle and upper atmosphere. Techniques were found for the spectral processing of recordings of fluctuations in solar radio emissions in the centimeter band and cosmic ray variations to register atmospheric waves at various heights was revealed (II [Institute of the Ionosphere]).

In the area of applied research, the characteristics of nonmagnetic time-of-flight mass spectrometers were studied, the first 10 MI-1201-E mass spectrometers were manufactured at the Elektron PO [production association] in Sumi with the participation of the KazSSR Academy of Sciences' Institute of Nuclear Physics, a production flow chart for the Talliy-201 radium pharmacrutical was created and three lots were produced in full compliance with the "Temporary Pharmacopedic Article" for obtaining it.

Nuclear physics methods were used to run element tests on about 25,000 specimens of ore, petroleum and bitumens from Kazakhstan deposits, superpure metals produced by republic industry and environmental objects.

In the field of automation, mathematical models for renovating and developing civil aviation telegraph and telephone communications networks in the Kazakhstan region were developed and an algorithm for automatic switching to back-up in the event of malfunction of the main communications switching center was drawn up. Automated systems are being developed for discretly analyzing, picking up, recording, processing and storing experimental data and for using microprocessor equipment and the scientific instruments available at a number of institutions of the Academy of Sciences (IMM) to control experiments. The collection, storing and preprocessing information from Kazakhstan digital magnetovariation stations have been automated (II). Hardware components and programs have been developed for processing half-tone images which are used in a number of republic organizations (IFVE).

The USSR Goskomizobreteniy [State Committee for Inventions and Discoveries] received 29 invention [patent] applications, 12 author's certificates were obtained, there were 16 affirmative decisions and four rejections; four monographs, eight special-topic collections and six brochures, two of which were in the popular-science field, were published, as were more than 600 scientific articles.

The socialist obligations assumed in 1986 were met. The collective at the Institute of Mathematics and Mechanics was awarded first place for high indicators in socialist competition among department institutions and the collective of the Institute of the Ionosphere was awarded second place.

There have also been shortcomings, along with the positive aspects of department institute activity.

Work results on concentrating scientific forces on priority research areas cannot be deemed satisfactory. Few scientific developments are being introduced at republic and union industrial enterprises. No department institutions are using Form R-10 to calculate actual economic impact. Creation of the Taliy-201 [sic] radium pharmaceutical production flow chart in the "introduction" section of the economic and social development plan was done without adequate substantiation, resulting in incomplete fulfillment of the state plan assignment (IYaF). The number of inventions decreased in the reporting year in comparison with 1985. The "Laser Engineering" republic scientific-research program was not carried out in full (lead organization: IYaF). Several unique instruments are still being exploited insufficiently effectively and the collective use of scarce equipment is not widespread. Morale and the psychological climate are not yet at the proper level at individual institutes.

The Kazakh SSR Academy of Sciences Presidium has approved the report on the scientific and scientific-organizational activity of institutions of the Department of Physical and Mathematical Sciences for 1986 with respect to the resolutions of the 27th CPSU Congress and the 16th Congress of the Kazakhstan Communist Party and recommends it for review at the department General Assembly session.

The Presidium recommends that the Department of Physical and Mathematical Sciences hold a department General Assembly session devoted to discussing and developing measures concerning the CPSU Central Committee and USSR Council of Ministers Decree "On Intensifying Scientific Research in Mathematics and Its Applications and Improving the Working and Living Conditions of Scientists Working in This Field."

The Presidium orders the department bureaus and the leaders of scientific institutions to: — take steps to eliminate the indicated shortcomings; — ensure continued growth in the effectiveness and quality of scientific research in light of the resolutions of the 27th CPSU Congress and the 16th Congress of the Kazakhstan Communist Party.

11052 CSO: 1814/0030

Restructuring Report by AN Kazakh SSR Central Kazakhstan Department for 1986

18140030a Alma-Ata VESTNIK AKADEMII NAUK KAZAKHSKOY SSR in Russian No 4, Apr 87 pp 11-14

[Article under the heading "In the Presidium of the Kazakh SSR Academy of Sciences": "Restructuring Progress and the Results of 1986 Scientific and Scientific-Organizational Activity by Institutions of the Kazakh SSR Academy of Sciences' Central Kazakhstan Department in Light of the Resolutions of the 27th CPSU Congress and the 16th Congress of the Kazakhstan Communist Party"]

[Text] Having examined the issue of restructuring progress and the results of 1986 scientific and scientific-organizational activity by institutions of the Kazakh SSR Academy of Sciences' Central Kazakhstan Department in light of the resolutions of the 27th CPSU Congress and the 16th Congress of the Kazakhstan Communist Party, the Presidium notes that department scientific institutions have worked specifically to restructure their scientific and scientific-organizational activity, the results having been discussed at an enlarged meeting of the department bureau.

The department is comprised of seven scientific subdivisions, three of which are institutes, in which 736 people work, including nine doctors of sciences and 127 candidates of sciences.

In the reporting year, department scientific institutions worked on 52 projects. In comparison with the preceding five-year plan, the number of GKNT [State Committee for Science and Technology] projects completed increased from three to 11, and the number of republic economic and social development plan assignment projects carried out increased from seven to 18. The amount of work being done jointly with a number of ministries and departments (the USSR Ministry of Ferrous Metallurgy, Ministry of Nonferrous Metallurgy, Ministry of Chemical Industry, Ministry of Mineral Fertilizer Production, the Kazakh SSR Ministry of Nonferrous Metallurgy, and others) increased significantly.

In the reporting year, nonferrous metallurgy research (Chemical-Metallurgical Institute) was focused on a new scientific area of inquiry, chemical enrichment and heat treatment of the nonferrous and rare-earth metals of Central Kazakhstan and similar regions in other areas. This research anticipates the first development in the USSR of the theory of and fundamentally new technology for enriching oxide and mixed nonferrous metal ores by hydrothermal and electrochemical sulfidization. Twenty-two patents were obtained in foreign countries for thermomagnetic enrichment techniques and patents on another two techniques are pending.

This work was done to meet the necessity for outstripping development of the raw-material base and improving the technical level of nonferrous metallurgy within the framework of GKNT assignments, the international cooperation plan for the "MP-4," "Verkhneye Kayrakty," "Zhayrem" (USSR Ministry of Nonferrous Metallurgy) and "Sibir'" all-union interbranch scientific-technical programs and the republic "Mineral Resources" program.

In the field of ferrous metallurgy, the institute is one of the lead institutions in the "Metallurgical Processing of Phosphorous Ores of the Lisakovsk Deposit" interbranch program of the USSR Ministry of Ferrous Metallurgy, Kazakh SSR Gosplan and Kazakh SSR Academy of Sciences. It also does research on assignment from the GKNT and under the coordination plan of the USSR Ministry of Ferrous Metallurgy and Kazakh SSR Academy of Sciences in three republic programs.

Good scientific results have been achieved in studying chemical ionization in oxidation and combustion and they have been used to develop energy-saving ways and means of burning fuel and improving fire and explosion safety. The subject matter of this area is part of the GKNT program.

The Institute of Organic Synthesis and Carbon Chemistry [IOSU] has developed new electrocatalytic recovery methods for various classes of unsaturated compounds. New heterogenous catalysts and ways of synthesizing carbolic acid amides and hydrosides have been found and a theoretical interpretation of the reactivity of the nitrile series has been offerred. A number of new terpenoidal compounds and alkaloids have been derived from the wild flora of Kazakhstan and new medicines, developed on assignment from the GKNT, have been synthesized from them.

A method of reagent-free, complex processing of phosphorous slag to produce pure phosphorous and organophosphate compounds is being patented in six foreign countries (the USA, Japan, the FRG and others). The Ministry of Mineral Fertilizer Production has joined in creating a three-year temporary collective to deal with this problem.

Recommendations on strengthening shaft drifts at Karagandaugol mines and [on developing] technology for obtaining feedstock for a metatrexate antitumor compound at the Shchelkovskiy Vitamin Plant have been incorporated into the implementation plan by the institute.

In the field of hygiene and occupational diseases, the spread of shaking sickness among miners at the Karaganda Coal Basin was studied for the first time, with a correlation being established between the onset of the disease and age, time on the job and occupation, permitting the delineation of a complex of very informative methods of diagnosing shaking sickness and the development of courses of treatment whose introduction has reduced the average stay of a patient in the dispensary (by 34 percent for stage-I illness and by 16.7 percent for stage-II); the materials became the basis for three methods instructions of unionwide importance.

Hygiene-ergonomic evaluations were made of eight new machines and piecesof equipment developed by planning-design institutes for mines at the Karaganda Coal Basin, the DGMK [not further identified] and the Sayakskiy and Zlatoust-Belouskiy quarries.

During the reporting year, the department took active steps to strengthen its ties with production. Experimental pilot complexes were created at the DGMK and BGMK [not further identified] to verify institute developments, and an agreement was concluded with the Karaganda Oblast vocational-technical education administration on the manufacture of prototype small-series instruments and sensors.

The list of scientific research projects was reviewed with respect to their implementation of the resolutions of the 27th CPSU Congress and the 16th Congress of the Kazakhstan Communist Party, as well as in connection with the changeover of all department institutions to the new wage system, resulting in a reduction of the total from 52 to 41 and in a new institute structure. The previous 24 laboratories and one structural group at the KhMI have been replaced by 18 laboratories and five groups; there are now six instead of eight at the IOSU and six instead of nine at the IGTiPZ [Institute of Labor Hygiene and Occupational Diseases].

Certification was done at the KhMI and IOSU, resulting in 63 of the 373 associates checked being deemed not suited to the positions they held (46 at the KhMI and 17 at the IOSU), with 19 being released. Promotions were recommended for 93 (60 at the KhMI and 33 at the IOSU). The new wage conditions have been introduced at these institutes.

A broad-scale experiment is underway at the KhMI to switch laboratory financing and associates' wages to dependence on end results.

In order to determine its prospects for development, the institute drew up scientific and social development plans for the collective for the 12th Five-Year Plan.

Six monographs, five collections, two methods instructions and 531 articles and theses based on research results were published in republic, union and international publications in 1986. One doctoral dissertation and 16 candidates' dissertations were defended. Four patents were obtained (the FRG, Sweden, Italy) as were two certificates from the Japanese Patent Office, 28 author's certificates of invention [USSR patents] and 37

affirmative decisions to release them. Three new techniques are being patented which involve drawing up international orders, and applications have been submitted for a proposed discovery.

Two now-traditional KhMI conferences were held, the (3rd) All-Union Conference on Chalcogen and Chalcogenide Chemistry and Technology and the (9th) All-Union Seminar on the Electrophysics of Combustion Processes.

The coordination of scientific research in the region, which is done by the Interdepartmental Coordinating Council of the TsKO AN KazSSR [Kazakh SSR Academy of Sciences' Central Kazakhstan Department] and its seven scientific sections, which coordinate 64 projects, 45 of which are being carried out by republic VUZ's and the NII [scientific-research institutes] of other departments, improved somewhat. The council formulated and approved a comprehensive target program, "Central Kazakhstan," and a regional program on environmental protection and the effective use of recovered resources up to the year 2000, to be carried out as a section of the republic program.

At the same time, there were substantial shortcomings and mistakes in the scientific-organizational activity of the department.

Department institutes failed to use every reserve for concentrating personnel and material resurces in the leading areas, the proportion of work being done on assignment from the GKNT and under Kazakh SSR and USSR economic and social development plans is not high enough (61 percent), and the following problems are being solved slowly: the creation of experimental pilot complexes and pilot manufacturing centers at region enterprises and associations, the involvement of institutes in the MNTK [not further identified], and the organization of temporary collectives of scientists and scientific-production associations.

The TsKO AN KazSSR MSK [Interdepartmental Coordinating Council] has not yet become an effective agency for coordinating scientific research in the region or an effective conduit for accelerated realization of results in the national economy, nor has it established contacts with the scientific councils of other Kazakh SSR Academy of Sciences departments.

The analysis of inventions and patenting them abroad has not been at the required level, resulting in the unavailability of licensing agreements to the institutes so far.

Department institutes have paid insufficient attention to increasing the scientific skills of theirs associates, to discovering talented young people and training them. Few doctors and candidates of sciences under the age of 30 are being trained (less than one in 16), especially at the IOSU and IGTiPZ. The average age of doctors of sciences at the KhMI is 52.8 and that of candidates of sciences — 43.1; the average age of laboratory heads has only dropped from 48.3 to 46.

The status of research in the mining-geological and economics sections is alarming. The number of projects to be used as the base for setting up an Institute for Comprehensive Utilization of Mineral Wealth in the 12th Five-Year Plan has remained practically the same. Their isolation from the lead Academy institutes negatively affects research results and the quality of training of scientists.

Department institutes have little modern equipment and few modern instruments, especially one-of-a-kind ones. There is little use of computers in the department, and there are no YeS computers at all; the available equipment is not always used to its fullest.

The Presidium of the Kazakh SSR Academy of Sciences has approved the 1986 report on the scientific and scientific-organizational activity of the TsKO AN KazSSR and has recommended it for review by the department General Assembly session.

The Presidium ordered that the department bureaus and scientific institution leaders do the following: — focus the efforts of the collectives on developing priority areas which will ensure intensification of the region's scientific-technical potential and increase the effectiveness of the scientific research itself; — take effective steps to create experimental pilot centers and production facilities, branch laboratories, temporary collectives and so on at the larger industrial enterprises of the region's NPO [scientific-production associations] in 1987; — develop a work program prior to 1 Jun 87 for training young people as doctors and candidates of sciences; — work out measures within two months to strengthen the material-technical base of the institutes by providing them with modern, unique equipment and computers.

The vice presidents of the Academy of Sciences and the department heads of the Kazakh SSR Academy of Sciences Presidium apparatus were instructed carry out a number of assignments.

CSO: 1814/0030 11052

Medals, Prizes Awarded by USSR Academy of Sciences

18140184 Moscow KHIMIYA I ZHIZN in Russian
No 9, Sep 87 p 26

[Article under the rubric "Information": "Awards"

[Text] The 1987 Ye.N. Pavlovskiy Gold Medal was awarded to Corresponding Member of the USSR Academy of Sciences V.L. Kontrimavichus for a series of works on ecological parasitology and the classification of helminths.

The 1987 I.I. Menchikov Gold Medal was awarded to Academician R.V. Petrov for the series of works "The Control and Regulation of the Immune Response."

The 1987 V.V. Dokuchayev Gold Medal was awarded to Corresponding Member of the USSR Academy of Sciences G.V. Dobrovolskiy for the series of works "The Genesis, Geography, and Protection of Soils."

The 1987 V.A. Kargin Prize was awarded to Doctor of Chemical Sciences N.F. Bakeyev (the Scientific Research Institute of Physical Chemistry imeni L.Ya. Karpov), Doctor of Chemical Sciences A.L. Volynskiy (Moscow State University), and Candidate of Chemical Sciences Ye.A. Sinevich (the Scientific Research Institute of Physical Chemistry imeni L.Ya. Karpov) for the work "The Mechanism of Deformation and the Structure and Properties of Polymers Which Have Undergone Cold Drafting in Liquid Media."

The 1987 I.I. Mechnikov Prize was awarded to Doctor of Biological Sciences I.S. Darevskiy (the Zoology Institute) for the series of works "The Origin and Role in Evolution of Natural Parthenogenesis Among Higher Vertebrates."

The 1987 D.I. Mendeleyev Prize was awarded to Candidate of Chemical Sciences V.L. Kuchayev, Candidate of Chemical Sciences L.M. Nikitushina, and Doctor of Chemical Sciences M.I. Temkin (the Scientific Research Institute of Physical Chemistry imeni L.Ya. Karpov) for the work "The Mechanism of the Oxidation of Gases by Molecular Oxygen and Nitrogen Monoxide on Platinum in Their Interrelationship."

The 1987 N.D. Zelinskiy Prize was awarded to Academician Kh.M. Minachev, Corresponding Member of the USSR Academy of Sciences O.M. Nefedov, and Candidate of Chemical Sciences V.V. Kharlamov (the Institute of Organic Chemistry imeni N.D. Zelinskiy) for the work "The Development of the Scientific Principles of the Technological Method of Obtaining Allyl Acetate by the Catalytic Acetoxylation of Propylene."

The 1987 A.N. Bakh Prize was awarded to Doctor of Biological Sciences A.V. Kotelnikova and Doctor of Biological Sciences R.A. Zvyagilskaya (the Institute of Biology imeni A.N. Bakh) for the series of works "The Biochemistry of Yeast Mitochondria."

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Determination of Value, Price of Applied Developments

18140138 Moscow KHIMIYA I ZHIZN in Russian No 9, Sep 87 pp 23-26

[Article by Candidate of Economic Sciences N.I. Burova and Ye.B. Tsyrkin under the rubric "The Theme of the Day": "How Much a Development Is Worth. Notes on Cost Accounting in Applied Science"]

[Text] "The radical reform of pricing is a most important component of the restructuring of the management of the economy. Without this the complete changeover to the new mechanism is impossible.

"The price should play an important stimulating role in the improvement of the use of resources, the decrease of expenditures, the increase of product quality, the acceleration of scientific and technical progress, and the rationalization of the entire system of distribution and consumption."

From the report of M.S. Gorbachev at the June (1987) CPSU Central Committee Plenum

In recent times it has even become somehow uncomfortable to write about the efficiency of applied science. But now a decision has been made on the changeover of all industrial sectors to cost accounting, and in the economics of sectorial science an entirely new task has appeared: to determine the specific price of each new scientific research development. And indeed, if an entire sector changes over to self-financing, scientific research organizations should recover their own expenditures and create their own development and stimulation funds from the assets, which have been received from the sale of the results of their activity and from the results of their research. Scientific research developments are becoming a commodity, moreover, a popular commodity, and, therefore, should have a price. How is it to be determined?

As should have been expected, practically all the suggestions were oriented in one way or another toward the production cost of the development, to which a certain percentage of profitability is added. The disputes are merely about what it is to be: 40 percent, for example, or 80 percent? The following opinion also exists: to establish the price of a development with an incentive markup that depends on the efficiency of research. The suggestions to differentiate the percentage of profitability subject to the time of the carrying out of the development and its technical level are also well known.

The common thing in all these suggestions is the obvious inability of their authors to avoid the stereotype which has formed in the practice of the pricing of industrial products. And that is why, whether they like or not, the very same expenditure method is duplicated. Here the obvious and subtle differences of the results of the labor of production workers and researchers are being forgotten.

First of all, in case of the output of an industrial product there are no particular problems with the planning and standardization of expenditures. As for the scientific research development, here there are not only no standards, but even no constructive suggestions on how to determine the expenditures. The question, it seems, is simple: How much does it cost to develop, say, a catalyst? We know of a case, when at the beginning of the 1970's an entire institute laboratory over several years dealt with the development of a catalyst of the deep hydrogenation of aromatic hydrocarbons in petroleum fractions, but the catalyst, which was obtained by the large collective, did not sell, because it did not satisfy the demands made on it. The ministry involved another institute, at which a group of seven people solved the problem in a year.

There are many such examples. They all confirm what is well known: the success of a scientific development is determined not by the number of spent man-months, but by entirely different, for the most part subjective circumstances—the methods, scientific, and technical level of the work of the institute as a whole, the equipment of its laboratories and pilot-scale plants, previous work experience, the availability of skilled and talented researchers, the system of stimulation, and enthusiasm. More briefly, by everything that is now incorporated in the concept of the human factor. We venture to assert that precisely the human factor should be taken into account first of all in the planning of scientific research developments, but only not for the formation of standards of expenditures on them. It is especially important to understand this, if you take into account the considerable uncertainty and the degree of risk in case of the planing of the time and results of scientific research.

The second shortcoming to the expenditure approach to the formation of the price for a scientific research development is not so obvious. The point is that the applied scientific research institute is a conglomerate of technological and specialized laboratories, as well as ancillary scientific and technical and organizational subdivisions. Indeed, the development of the same new catalyst is carried out simultaneously in many laboratories. Physical chemists and analytical chemists help the process engineers, in another laboratory they study the thermodynamic characteristics of chemical reactions, tests take place at installations of the pilot plant, the patent division draws up applications for inventions, economists calculate the efficiency of the development at its various stages. Incidentally, *Khimiya i Zhizn* had already told about this in detail in the article of our colleagues V.N. Peresunko and I.A. Sadchikov "How to Share the Laurels" (No 1, 1986—the editorial board).

But each of the institute subdivisions deals simultaneously with not one job, but several. And it is necessary to have great courage to assert that someone can with sufficient accuracy divide the expenditures among the different developments. Let us add that in all the laboratories, in which the matter has been organized intelligently, preliminary unplanned research, the results of which are never guaranteed, is always conducted, while the expenditures are concealed in so-called planned themes. Our experience and the experience of many of our colleagues testify that the expenditures on this research, which is not taken into account in the reporting, amount to 10 to 40 percent of the spending on an entire development as a whole. Moreover, such "hidden" spending is all the more greater, the more efficiently the research collective works. Did they not enable a small group to develop a catalyst, over which an entire laboratory sweated unsuccessfully for years?

So, is there no accounting in sectorial science? There is accounting, there are even special directive instructions on how to determine the cost of a development. But let us speak frankly: the majority of directors of scientific research institutes and the chiefs of their planning divisions are very skeptical about the accuracy of the estimate of the expenditures on scientific research developments. If necessary they shift the expenditures from one theme to another without the least hesitation, and no one will ever in their life be able to prove the correctness or incorrectness of such actions. And no one is trying to. The impression is created that here we are dealing with the same kind of situation, in which teachers recently found themselves. When the rayon department of public education or the director of a school "recommends" that a D not be given, in order not to ruin the indicators of progress, educators were forced to act according to the principle: "we write a C, carry a D."

Finally, there is another consideration against the expenditure principle when determining the price of a scientific research development. Assume that someone all the same succeeded in estimating with satisfactory accuracy the expenditures on a development. Then it is quite obvious that given the existing restrictions with respect to the profitability the sum, which the institute should receive for its works, cannot be greater than some specific amount. Let us explain: if all the expenditures of a scientific research institute come to 7 million rubles a year, the total sales volume of the scientific product in case of a maximum profitability of 50 percent cannot exceed 10.5 million rubles. This automatically has the result that the workers of the institute, having before themselves such a limit, will strive to attain it—and that is all. All the appeals to do more and to do it better with the same expenditures will be in vain. Sad experience of this sort already exists: the directors of institute laboratories secretly hindered the introduction of new developments, since the already introduced developments provided the maximum established bonuses in the amount of six annually salaries, and cautiously withheld effective results for "a rainy day." Such is the inevitable effect of any unwise restrictions.

Another negative phenomenon, to which the expenditure approach gives rise, should be mentioned. We have already spoken about the fact that various developments are carried out simultaneously in every laboratory and at the institute as a whole, but the chances for their successful completion and practical implementation are different. Of course, when planning the expenditures the managers of laboratories report to the planning division that a large portion of the working time will be spent precisely on those jobs which promise a good result. But no one, except the performers, knows how it will happen in practice. Incidentally, this also does not interest anyone. However, it turns out that a theme with the high probability of a practical outcome, whether or not it is labor-consuming, quite naturally proves to be the most expensive one. The accounting is rather good! But you know, it is even somehow uncomfortable to blame the manager of a laboratory or a theme for such a harmless prank.

There is an interesting detail. In recent years the managers of laboratories and specialized subdivisions have been constantly turning to us, the workers of the technical and economic service of the sectorial institute, and have been asking in a friendly way for advice: To which of the technological themes is it best of all for them to attribute the spent man-months, in order then to receive more of a bonus?

Apparently, the time has come to recognize the fact of the existence of such double, or else triple accounting in the determination of the cost of scientific developments. But this does not mean that it is not necessary to take into account and to plan the expenditures on scientific research developments. Only this should done not with respect to themes, but for the scientific research institute as a whole, while bearing in mind the complex nature of modern developments and their multistage nature, as well as while remembering that the efficiency of the work of the institute is an aggregate indicator which compares the expenditures and the results.

As to the prices of developments, here there is a simple and, in our opinion, reasonable solution. The expenditures on a theme do not interest its client to any extent, the impact obtained in case of the implementation of a development interests him. We are dealing with a specific commodity, the use value of which is determined by the amount of the obtained impact. It should also determine the price of a development. Moreover, it is easy to imagine a situation, when two competing institutes propose a new technology for introduction. It is quite obvious that the client will make his choice in favor of the more efficient one or in case of negligible differences of the indicators of efficiency in accordance with some other criterion that has nothing in common with the expenditures on the development.

Such an approach puts everything in its place. The sum, which was obtained during the year for all the research that was completed and turned over to the clients, is the

sales volume, or the commodity production of the scientific research institute. The sum of all the annual expenditures is the production cost of developments—both the sold ones and the ones left in reserve, as well as those which will never be implemented, that is, the inevitable failures in scientific research. The difference between the commodity production and the production cost is the profit. It is most simple, and, what is more important, all the prerequisites are created for full cost accounting, including self-support [samookupayemost] and self-financing.

A little more in detail about the interrelations with clients. As in the past, the institute conducts basic research at its own risk—it is impossible to live without a scientific reserve. A specific portion of the obtained results will indicate the real technical possibility and the economic advisability of the development of a new technology. The potential clients—departments and industrial enterprises—are informed of this. If they have a need for the innovation, contracts, in which the demands on the development and the time of its completion are recorded, are concluded. At the same time the economic impact is calculated. The developer, that is, the institute, guarantees the quality of the product, which will be obtained in accordance with the new technology, and the other most important technological and economic indicators of the future development. But the client enterprise also has its own obligations. It guarantees the extent and time of the introduction of the development, for the total impact also depends on this. When the future economic impact, which is guaranteed by the obligations of both high contracting parties, is known, it is possible to establish the price of the development, the so-called limit price. It protects science by restricting the lower limit of the value of the result that was obtained in laboratories. Even if the client does not meet his obligations and is not able to implement the development purchased by him, the institute, which met all his demands and all its own long-term obligations, will be better of than before.

In case of such a determination of the prices for the scientific result the research collective is quite capable of obtaining an excellent profitability—1,000 percent and even more. Especially if the researchers will come upon their own "vein of gold": they will develop pioneering technologies, which will find application in many sectors, and will organize the sale of foreign licenses. This should not frighten anyone. On the contrary, the efficiently working scientific collectives and the dependent institutes, which live at the expense of their ministries, will be easily identified. While the national economy and industrial sectors will obtain additional assets, since it will develop impartially a progressive scale of deductions from the scientific excess profits—both for the state budget and for the fund for the development of production, science, and technology of the ministry.

Of course, it is also necessary to stimulate sectorial science, otherwise it will be possible only to dream of such excess profits. We believe that along with the progressive scale of deductions from the profit for centralized funds it is also necessary to envisage a progressive scale of deductions from the remaining profit for the material stimulation funds of scientific research institutes. Thus the interests of the developer, the client, the entire sector, and the entire national economy will be harmoniously combined.

And a final thing. It seems to us that given such an approach to the expenditures on science internal cost accounting will begin to operate at institutes. All the laboratories and services will begin to strive not only to plan the expenditures more accurately, but also to optimize them, on the basis of natural, and not far-fetched criteria. If all the questions of the calculation and accounting of expenditures are farmed out to institutes, it is possible not to doubt that the researchers will themselves very quickly look into everything and their mutual monitoring will become so effective that the number of forged man-months will be reduced to a minimum. Or else will turn to zero.

We believe that our suggestions will be to the liking of the overwhelming majority of managers of the economic services of applied institutes. Apparently, it is now a matter of a small thing: that those, on whom the making of decisions and the development of all the necessary norms and documents depend, would consider these suggestions.

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Marchuk on Development of Soviet Basic Science

18140135 Moscow EKONOMICHESKOYE SOTRUDNICHESTVO STRAN-CHLENOV SEV in Russian No 10, Oct 87 pp 19-26

[Article by President of the USSR Academy of Sciences Academician Guriy Marchuk under the rubric "The 70th Anniversary of Great October": "Basic Science in the USSR"]

[Text] A characteristic trait of the 20th century is the rapid growth of science and its increasing importance in the life of society. Whereas at the very beginning of the century this found expression in the revolution in the natural sciences, in the middle of the century it finds expression in the scientific and technical revolution, which has encompassed practically all fields of knowledge and all spheres of technology and production. Profound social processes, first of all the October Socialist Revolution in the USSR and the formation of the world socialist system, as well as the changes in the world, which are occurring in connection with this, are having an enormous influence on scientific and technical progress.

From October 1917 to Our Days

The October Socialist Revolution changed radically the status and role of science in our country. Developing under the new historical conditions the fundamental precepts of Marxism about the role of science, V.I. Lenin stressed its exceptional importance for the building of socialist society. Since that time the progress of science, education, and culture has been regarded in our country as the basic prerequisite of the overcoming of backwardness, the formation of a highly developed economy, and the social and spiritual progress of the people.

Since the first years of Soviet power the state has taken upon itself all the concern about the organization and supply of scientific research. The best minds of Russia, first of all the scientists of the Academy of Sciences, were enlisted for the solution of the most important national economic problems, first of all for the drafting of the plan of electrification, which became, as Lenin expressed it, the second program of the party.

Under the difficult conditions of the civil war and intervention, economic dislocation and famine the Soviet Government gave support to scientists, financed scientific work, and established universities and scientific research institutes, moreover, not only of the applied type, but also for the elaboration of basic problems. Thus, during 1918-1925 the Institute of Physical Chemical Analysis, the Radium Institute, the Physics and Mathematics Institute, the Petrograd Physical Technical Institute, the Physiology Institute, the Soil Science Institute, and other institutes were established under the Academy of Sciences.

Not by chance were outstanding results obtained in our country already in the 1920's in mathematical physics, applied mechanics, the study of the mechanical and electrical properties of solids, atomic spectra, and the structure of the atom, and in the field of inorganic chemistry, the physiology of higher nervous activity, botany, genetics, and geochemistry. In practice the foundations of the rapid development of basic science were laid at this time in the country, which found reflection in the subsequent stages of the building of socialism.

The technical modernization of the national economy, the socialist transformations of agriculture, and the cultural revolution, which were carried out during the years of the first five-year plans, were based on the achievements of science and technology. In turn, the development of the economy and education afforded new opportunities for the development of scientific research and the broadening of the activity of the academy, which in 1925 became the USSR Academy of Sciences. Its affiliates and bases emerged in the union republics. The republic academies, which became centers of scientific research and the training of scientific personnel, were subsequently organized on their basis.

In short, the conditions for the large-scale development of such directions as mathematics, mechanics, astronomy, physics, chemistry, and biology were being created. At the same time the contribution of Soviet scientists to the industrialization of the country, including to the progress of aviation and shipbuilding, communications engineering and geology, chemistry and metallurgy and to the strengthening of the defensive capability of the USSR, was increasing.

The economic, scientific, and technical potential, which was accumulated during the first five-year plans, made it possible during the bleak years of the war to solve quickly the most important problems of the front and rear, first of all to supply the armed forces with advanced materiel. The active work of scientists contributed to the victory of the Soviet people in the Great Patriotic War and to the postwar restoration and reconstruction of the national economy.

Meanwhile the world entered the age of the scientific and technical revolution. Its achievements afforded new prospects in the development of society. Owing to the achieved level of basic research and the advantages of a planned economy Soviet scientists in the shortest possible time solved such most difficult scientific and technical problems as the mastering of the energy of the atomic nucleus, the going into space, and the development of electronic means of processing information. Precisely on this basis—despite the attempts of imperialist circles of the West to achieve military superiority—the security of our homeland and the other socialist countries was ensured.

While contributing to the strengthening of the defensive capability, Soviet scientists did much for the peaceful use of the achievements of scientific and technical progress. The first nuclear electric power plant in the world was put into operation in the USSR back in 1954. Having advanced the idea of the accomplishment of controlled thermonuclear fusion, scientists of our country were the first to launch experimental research in this field. The launch in 1957 of the first artificial earth satellite and the flight of Yu.A. Gagarin paved the way for mankind into space.

The elaboration of the problems of nuclear power, rocket and space technology, modern aviation, and electronic computer hardware required the launching of basic and applied research and the assimilation of new technologies and production processes. This was the start of a new stage of the development of basic research, first of all at the USSR Academy of Sciences. In 1957 the Siberian Department of the USSR Academy of Sciences was organized, while in 1969-1970 the Ural and Far Eastern scientific centers were organized. At scientific institutions of the academy large experimental plants were built and computer centers, which were equipped with computers, were established.

Since 1961 all the union republics have had their own national academies, which have made a significant contribution to the development of basic science, the search for natural resources, and the study of the history and culture of peoples.

During the postwar decades basic research in the most important directions of science, including in theoretical, applied, and computational mathematics, in the field of nuclear physics, plasma physics, astrophysics, quantum electronics and optics, solid-state and semiconductor physics, chemical kinetics and catalysis, elementoorganic chemistry, the chemistry and technology of materials, and special electrometallurgy, underwent further development in our country. At the same time steps were taken on the elimination of the negative influences in biological science and on the rapid development of its new directions—physical chemical biology, biochemistry, and technical microbiology.

Being today the leading center of basic research, the USSR Academy of Sciences unites more than 270 institutions which are located in different corners of the country. More than 50,000 scientists work at them.

The Achievements of Soviet Scientists

In 7 decades the discoveries and achievements of Soviet scientists have enriched many fields of the natural sciences; their contribution to world scientific and technical progress constantly increased. Thus, the works of mathematicians I.M. Vinogradov and N.N. Luzin in the field of the theory of numbers and the theory of functions became well known. New approaches in the theory of differential equations and in functional analysis, in the theory of probability, algebra, topology, and mathematical logic, and in the development of the mathematical theory of optimum control were proposed. Applied mathematics underwent development in the works of M.A. Lavrentyev, M.V. Keldysh, and others. Computational mathematics is being successfully developed in connection with the emergence of electronic computer technology, for the progress of which S.A. Lebedev did much.

On the basis of the ideas of N.Ye. Zhukovskiy and S.A. Chaplygin important results were obtained in the aerodynamics of high subsonic and supersonic speeds and in hydrodynamics. Significant gains were also achieved in the mathematical theory of elasticity, the theory of plasticity, and nonlinear mechanics.

In the study and development of space great services belong to S.P. Korolev and M.V. Keldysh. In the 20 years, which have passed since the launching of a Soviet artificial earth satellite, the first in the world, our notions about near-earth space, the interplanetary environment, the sun, the planets, and the influence of processes in space on the ionosphere and upper atmosphere of the earth have changed substantially. Soviet science has added brilliant pages in the study by means of automatic spacecraft of the moon and the closest planets of the solar system, particularly Venus. The direct studies of Venus and Halley's Comet in accordance with the Vega Program were a great achievement. The work on board manned orbital stations is encompassing a broader and broader group of problems of basic science.

In the field of astronomy important results were obtained in the study of stellar systems, the nuclei of galaxies, variable stars, and diffuse matter in interstellar space, in cosmogony, and in solar physics. In recent years astronomical research has been conducted by means of a 6-meter optical telescope, the largest in the world, as well as instruments and earth satellites, which have been placed into orbit. Important results have been obtained in radio astronomical observations, in the radar of planets, and in X-ray astronomy.

The discoveries and achievements of Soviet scientists have enriched many sections of the physical sciences. Theoretical physicists V.A. Fok, I.Ye. Tamm, L.D. Landau, N.N. Bogolyubov, and others made a large contribution to the development of statistical physics, quantum field theory, the theory of superfluidity and superconductivity, and the theory of plasma, the nucleus, and the solid. In past decades much was done in the development of the theory of strong interactions—quantum chromodynamics.

Back during the prewar years in the USSR studies of the atomic nucleus and cosmic rays were launched, showers in cosmic rays and the phenomenon of the spontaneous fission of nuclei were discovered. During the years of the war V.I. Veksler discovered the principles of the operation of high-energy charged particle accelerators. Synchrotron radiation was predicted, and its theory was developed. Soviet scientists under the supervision of I.V. Kurchatov made major gains in the development of various aspects of the use of atomic energy for peaceful purposes.

During the postwar period with the development of large charged particle accelerators in the USSR studies of atomic nuclei and elementary particles were expanded. In experiments on the Serpukhov proton accelerator new elementary particles were discovered, important laws of their interaction at high energies were established. With the placement into operation of underground neutrino observatories research on neutrino physics and astrophysics is being developed. Studies of particles of very high energies, which come from outer space, are being conducted. At the Joint Institute for Nuclear Research in Dubna Soviet scientists jointly with scientists from the socialist countries are elaborating problems of relativistic nuclear physics and are performing work on the obtaining and study of transuranic elements.

Soviet physicists are successfully conducting research on the problem of controlled thermonuclear fusion. Their developments, first of all the TOKAMAK system, were made the basis of the programs of thermonuclear

research, which is being conducted by many industrially developed countries. Experiments of recent times have shown that in systems of such a type it is possible to obtain hot plasma with thermonuclear parameters. Alternate means of accomplishing controlled thermonuclear fusion have been proposed—the heating of plasma with the beam of a powerful laser and with an electron beam, as well as the catalysis of nuclear fusion by muons.

Important achievements exist in optics and radiophysics. These are the basic works of S.I. Vavilov and his students in the field of luminescence and the discovery of the radiation of an electron moving with supersonic speed in a medium, which is known as Vavilov-Cherenkov radiation. In the early 1950's at the Physics Institute imeni P.N. Lebedev of the USSR Academy of Sciences the foundations of quantum electronics were laid and various types of lasers were developed. After their appearance in the USSR nonlinear optics, laser spectroscopy, and color holography underwent development. Studies of the propagation of radiowaves of various bands of wave lengths and on statistical radiophysics were conducted (L.I. Mandelshtam, N.D. Papaleksi, and others). Much was done in the assimilation of the submillimeter band of electromagnetic waves and the development of radiophysical methods of studying the natural environment.

The contribution of Soviet scientists to solid-state physics, particularly to the formulation of the basic notions of the quantum theory of the condensed state of matter (Ya.I. Frenkel and others), to the theory of crystallographic systems (A.V. Shubnikov), and to the study of the mechanical electrical and magnetic properties of solids is significant. In the 1930's systematic studies of semiconductors were begun on the initiative of A.F. Ioffe. In recent decades the principles of the development of power semiconductor current transformers, semiconductor heterostructures, and semiconductor instruments, which are used in microelectronics and optoelectronics, have been formulated. A new direction in semiconductor physics—acoustoelectronics—emerged owing to the work of Soviet scientists.

The studies of magnetic phenomena, including phenomena in variable magnetic fields and ultrastrong magnetic fields, were marked by major achievements. The phenomenon of electron paramagnetic resonance, which was discovered by Ye.K. Zavoyskiy, became the basis for in-depth studies of the structure of solids, liquids, and molecules.

The discovery by P.L. Kapitsa of the superfluidity of liquid helium was a spectacular achievement in the field of low-temperature physics. Soviet scientists provided a theoretical explanation for this phenomenon and discovered and studied new macroscopic quantum phenomena—quantum crystallization and quantum diffusion. In recent times work on high-temperature superconductivity has been conducted at a rapid pace.

The studies of the processes of the growth of crystals made it possible to obtain diverse single crystals, which are necessary for the development of many fields of modern technology. The work of L.F. Vereshchagin on solid-state physics at high pressures made it possible to develop a technology of obtaining synthetic diamonds, including large polycrystalline diamonds, as well as cubic boron nitride. During basic research on the behavior of matter at ultrahigh pressures record steady-state pressures were achieved; here the transition of dielectrics to a metallic state was observed.

Back during the first years after the October Revolution the chemical sciences underwent much development. The research of L.A. Chugayev (in the field of complex compounds), N.D. Zelinskiy (transformations of hydrocarbons, petrochemistry), and N.S. Kurnakov (methods of physical chemical analysis) was marked by major achievements. In the early 1930's the first industrial method in the world of obtaining synthetic rubber was proposed by S.V. Lebedev.

Significant gains were made in the field of organic synthesis and catalysis. The study of the laws of heterogeneous and homogeneous catalysis (A.A. Balandin, B.A. Kazanskiy), as well as transient catalytic processes (G.K. Boreskov) made it possible to develop highly efficient catalysts.

The development of elementoorganic chemistry is connected with the name of A.N. Nesmeyanov and his students. The research in this field made it possible to establish the laws of the formation of organic compounds of the majority of elements of the periodic system of D.I. Mendeleyev and their transformation in various reactions and to study the peculiarities of the chemical bond in them. Fundamentally new types of substances and materials were developed on their basis. The Kazan scientific school, which was headed by A.Ye. Arbuzov, made a large contribution to the chemistry of organophosphorus compounds.

The works of N.N. Semenov in the field of chemical kinetics, the chain theory of chemical reactions, and the theory of combustion and detonation became world famous. New physical methods of stimulating chemical reactions by means of radiation and light, laser radiation, shock waves, and plasma were developed.

The works of Soviet scientists, first of all A.A. Baykov and I.P. Bardin, had a large influence on the progress of ferrous and nonferrous metallurgy. An industrial technology of high-temperature alloys and new metallurgical processes were developed; metallothermy (self-propagating high-temperature synthesis) underwent development. In the development of the theory and practice of electric welding and in the development of new processes of special electrometallurgy a leading role belongs to the Institute of Electric Welding imeni Ye.O. Paton of the Ukrainian SSR Academy of Sciences.

Important results in the basic directions of biological science were achieved back in the 1920's and 1930's. The problems of the physiology of higher nervous activity underwent development in the works of I.P. Pavlov and his school. N.I. Vavilov discovered the law of homologous series in hereditary mutation and established the centers of origin of cultivated plants. Notions about the structure of the gene were developed in the works of N.K. Koltsov. In-depth research in biochemistry enabled A.N. Belozerskiy to prove the unity of the plant and animal world, V.A. Engelgardt to advance a biochemical conception of muscle contraction, and A.I. Oparin to propose a materialistic theory of the origin of life. A.N. Bakh made studies of the chemical nature of respiration. The works of D.N. Pryanishnikov and his school were devoted to agrochemistry and the theory of plant nutrition, while the basic research of Ye.N. Pavlovskiy and K.I. Skryabin was devoted to parasitology and helminthology. The theory of the biosphere was developed in the works of V.I. Vernadskiy; the idea of biogeocenoses was developed by V.N. Sukachev.

In recent decades research in physical chemical biology and biotechnology has been developed intensively. Soviet scientists have made a large contribution to the study of the structure and functions of nucleic acids, proteins and other biologically active compounds, and biological membranes. Effective means of obtaining a number of important drugs, vitamins, and other physiologically active substances were developed in the works on genetic engineering. The work on cell engineering of plants is affording prospects for the development of interspecific hybrids and virus-free lines of agricultural crops. Methods of the microbiological synthesis of fodder protein from the hydrocarbons of petroleum and other raw materials were developed.

Significant progress has been achieved in physiological science, particularly in the study of the mechanism of the transmission of the nerve impulse and the circulatory system, in the physiology of nutrition and sensory systems, and in the knowledge of the nature of higher nervous activity.

At the present stage much attention is being devoted to the problems of ecology and the protection of natural landscapes and ecosystems, their structure and functions under the influence of anthropogenic actions are being studied. The major works "Flora SSSR" [The Flora of the USSR] and "Fauna SSSR" [The Fauna of the USSR] have been written.

Work is being performed extensively in the field of the earth sciences. As a result of comprehensive research various geological maps, which are the basis of the search for deposits of minerals, were made. The geological study of the enormous territory of the USSR is of great scientific importance, especially for the elaboration of the global problems of the structure and development of the earth.

The works of V.I. Vernadskiy and A.Ye. Fersman contributed to the formation of geochemistry. The ideas about the formation of the basic crusts of the earth were developed by A.P. Vinogradov. Important results were obtained in the study of the gravitational field and shape of the earth and the seismic activity of various regions of the country.

Significant achievements exist in the formulation of the theoretical principles of ore formation, the study of the geology of the ocean bottom, and in geological and tectonic mapping. Methods of predicting strong earthquakes are being developed at the USSR Academy of Sciences and republic academies.

Studies of the world ocean are being actively conducted. Strong and lengthy counter currents have been discovered in the Atlantic and Indian oceans. Valuable results have been obtained in the field of the acoustics of the ocean and its biological structure and productivity. During a Soviet-American experiment, which was conducted in the 1970's in the Atlantic Ocean, a previously unknown phenomenon was discovered—the formation in the layer of waters of the ocean of systems of moving cyclonic and anticyclonic eddies. This, in essence, universal phenomenon broadened our notions about the nature of the formation of currents and extended the understanding of the interaction of the ocean and the atmosphere.

Soviet scientists are taking part in studies of atmospheric processes, including the general circulation of the atmosphere and the ocean, and in the development of weather forecasting methods. Methods of evaluating short-term changes of the climate with allowance made for the interaction of the ocean and the atmosphere, as well as energy-active zones in the ocean have been proposed.

Many of these achievements have been embodied in fundamentally new technologies, materials, machines, and instruments, moreover, several scientific ideas have stepped from the laboratories of scientists directly into production. Such was the case, for example, with synthetic diamonds and other superhard materials, lasers of various types, acoustoelectronic and other semiconductor instruments, and medicinal preparations. Such developments of academic scientific institutions as the technologies of power semiconductor current transformers, various single crystals, metallic materials, synthetic polymer materials, and catalysts and processes of microbiological synthesis found rapid practical implementation.

Steps Toward Advanced Technologies of the Future

The cited short and far from complete list of achievements of Soviet scientists in the field of basic science shows that in the USSR a large reserve has been created for the development of fundamentally new types of

equipment and technology, for in-depth research, which is called upon to accelerate the socioeconomic development of Soviet society, and for the further development of basic science.

The present stage in the life of the country, which is connected with the changeover of our economy to the path of intensification, is advancing qualitatively new demands on basic science. An intensive economy can be successfully developed only on the basis of the extensive use of basic scientific ideas. Through the latest technologies and original engineering solutions they should be implemented as new machines, equipment, and instruments of the highest technical level. In the present reproduction process—from the idea to the finished item—science holds a leading position.

A scientific idea enters the sphere of production through technology. While this means that technology is the link, which is at the meeting point of science and production, and combines them into a unified process. Moreover, the process of embodying basic ideas in the latest technologies, materials, and machines is becoming continuous. Hence the qualitative change of the role of basic research in the system of the organization of science and technology. Whereas previously this research developed mainly independent of production, now it serves as an integral link of the entire chain of modern scientific and technical progress and is at the source of this unified process. Technology is becoming a natural continuation of basic research.

The end of the 20th century has been marked by a number of major discoveries in science, which predetermined the rapid progress in technologies. First of all this is atomic energy, which has become the most important sector of power engineering, this is electronics, which embodied its ideas in computer hardware and automation equipment, this is physical chemical biology and genetics, which formed biotechnology as a new sector of the national economy. Today we have 20-30 promising technologies, which will determine the nature of scientific and technical progress at the threshold of the new century. Among them are laser and plasma technologies, technologies that involve the use of superconductivity and high pressures, powder metallurgy, high-temperature self-propagating synthesis, and others. Basic science gave rise to these and other technologies.

Under the conditions of an intensive economy the maintenance of the necessary pace of scientific and technical progress is possible only by the rapid and systematic embodiment of scientific ideas in the latest technological processes, materials, and machines. Therefore, basic research should lead the needs of engineering and production. Such is the most important requirement of the times.

This found reflection in the decisions of the 27th CPSU Congress and in the decrees of the January and June (1987) CPSU Central Committee Plenums. In them there were formulated the tasks: to attach priority importance to the development of basic science and to increase the responsibility of the USSR Academy of Sciences as the leading center of basic research for the development of the theoretical principles of fundamentally new types of equipment and technology. For the successful accomplishment of these tasks it is necessary to ensure a high, world level of basic research and to take a leading position in world science in the most important directions.

Basic research, which itself ensures the development of science and created the prerequisites for revolutionary changes in equipment and production, is just one aspect of the problem of the acceleration of scientific and technical progress. Another aspect of it is connected with the quickest materialization of ideas in equipment and the national economy. The new economic mechanism and the new system of the management of the economy, which were developed after the April (1985) CPSU Central Committee Plenum and were approved by the June (1987) Plenum, are creating the conditions for the rapid and extensive use of the achievements of science and technology. Scientific research institutes are called upon to play a leading role in the bringing of scientific ideas up to practical implementation and to apply developments. At the same time the tasks on the strengthening of the contacts of sectorial and basic science and on the integration of science and production follow from this. For this purpose in the Soviet Union scientific production associations are being established, interbranch scientific technical complexes are being formed, in short, steps are being taken so that science and production would move toward each other.

The scale and urgency of the task, which was posed for science, dictated the necessity of its thorough restructuring, including the activity of the USSR Academy of Sciences. This process is affecting the organization, management, planning, and coordination of scientific research and the manpower, material, and technical supply of science.

For the purpose of achieving a high level in the most important directions of science work is being performed on the forecasting and long-range planning of basic research. It is possible, only by having a clear prospect, to direct the work of large collectives and to concentrate their forces and material resources on leading gains. All-union programs of research in priority fields are being formulated on the basis of the forecasts.

The improvement of the management of science is called upon to eliminate excessive centralization, to extend democratic principles and glasnost, to create a more flexible structure of institutes, and to increase their independence. It is necessary not only to strengthen scientific schools, but also to ensure the influx of young talented scientists and to enlist them in the management of scientific subdivisions. While being concerned about the updating of the creative composition of personnel of

academic science, one must not forget the harmonious combination of the experience of scientists of the older generation with the enthusiasm and energy of young scientists. The personnel policy at the academy is called upon to promote the more complete use of the intellectual potential of the country and the increase of the labor productivity of scientists.

Having a powerful scientific and technical potential, the Soviet Union is striving to make a contribution to the solution of the global problems that face mankind and to the overall development of world science in the interests of progress and peace, especially as the intensive elaboration of all the most important tasks, which are being posed today by the logic of the development of science and by practice, is not within the power of an individual, even largest developed country. Under these conditions the international division of labor and the coordination of the concerted efforts of various countries are acquiring enormous importance.

The Soviet Union is a consistent advocate of international scientific cooperation with all states regardless of their social systems. Particular importance is being attached to the development of relations with socialist countries. The common tasks on the intensification of the economy of these countries dictate the necessity of the concentration of joint efforts on the decisive directions of science and technology. That is why we regard the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 (KP NTP) as a strategic document, as the basis for the close scientific and production cooperation of the fraternal states.

The key question of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 is to ensure the highest technical level of jointly developed products with the use of the latest achievements of basic science. The significant reserve, which has been created at the USSR Academy of Sciences, for the development of applied research and development in all the priority directions of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 serves this. Thus, the achievements of solid-state physics, laser physics, optoelectronics, and acoustoelectronics are the basis for the development of new generations of computer hardware, means of measurement and control, and new technologies. The achievements of biochemistry and physical chemical biology are serving progress in the development of medicines and preparations for animal husbandry and plant growing. At the same time we should think not only about today. That is why the assurance of a world level in the priority directions of basic science is so important. And this should be a common concern of all the participants in the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000.

The programs of cooperation and agreements, which were formulated on the basis of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000, for the most part are leading to the ultimate goals and gains, which have been outlined in it. However, a number of developments by the moment of their completion, apparently, will not ensure the achievement of the predicted world level. In this connection the participants in the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 need to perform work on the specification of the scientific and technical level of developments with respect to each problem of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 and to take additional steps on the assurance by the moment of their assimilation in production of the corresponding level. We also need to adjust our own organizational forms, in order to accomplish more successfully the tasks that face the scientists of our countries. We came to an agreement on a number of measures in this direction at the conference of executives of the academies of sciences of the socialist countries, which was held in May 1987 in Budapest.

The implementation of the Comprehensive Program of Scientific and Technical Progress of the CEMA Member Countries to 2000 will make it possible to attain leading levels of scientific and technical progress and, hence, to accelerate the socioeconomic development of all the states of the socialist community.

To contribute as much as possible to the accomplishment of this task—that is in what the USSR Academy of Sciences sees its greatest duty at the present stage.

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Israfil Piri ogly Kuliyev
18140029 Baku AZERBAYDZHANSKOYE NEFTYANOYE KHOZYAYSTVO in Russian No 3, 1987 pp 63-64

[Article by Z.M. Tairli and F.S. Samedov: "A Hereditary Petroleum Specialist"]

[Text] The 70th birthday of Doctor of Technical Sciences Professor Israfil Piri ogly Kuliyev, a CPSU member since 1946 and winner of the Lenin Prize, would have been on 13 February 1987.

I.P. Kuliyev was born in the family of a hereditary petroleum specialist. In 1932 the 15-year-old youth bound his life with the petroleum industry. In 1941 he graduated from the Azerbaijan Industrial Institute and in 1946 from the evening University of Marxism-Leninism. In 1949 Israfil Piriyevich defended his dissertation for the academic degree of candidate of technical sciences and in 1959 his dissertation for the academic degree of doctor of technical sciences. In 1960 the title of professor was conferred on I.P. Kuliyev.

In August 1941 I.P. Kuliyev voluntarily left for the front, and within the operating units of the Soviet Army took part in the liberation of the Northern Caucasus, the Ukraine, Poland, and Czechoslovakia.

Starting in 1950 I.P. Kuliyev worked as deputy director for scientific work of the State Scientific Research and Planning Institute of Offshore Petroleum. Being in this position for more than 25 years, Israfil Piriyevich showed himself to be a prominent scientist and skillful organizer of science and made a large contribution to the development of domestic petroleum science—the development of offshore petroleum and gas deposits. He supervised and took a direct part in the scientific research and planning and design work, which was connected with the construction of offshore petroleum and gas fields in the Caspian Sea, and in the matter of organizing the prospecting and development of petroleum and gas deposits in the Black Sea and the Sea of Azov and on the continental shelf of a number of foreign states.

Professor I.P. Kuliyev is the author of more than 300 scientific works, including more than 15 monographs and pamphlets and about 150 scientific articles, which were published in Azeri, Russian, English, and German, and 17 inventions. His major monographs—"Osnovnyye voprosy stroitelstva neftyanykh skvazhin v more" [Basic Questions of the Construction of Oil Wells at Sea], "Stroitelstvo neftyanykh skvazhin v more" [The Construction of Oil Wells at Sea], and others—were the first works in domestic and world literature, which have also not lost their topicality today.

The pedagogical activity of I.P. Kuliyev on the training of engineers and scientists of the highest skills was also fruitful: he trained more than 30 candidates and doctors of sciences. Starting in 1978 he headed the Economics, Organization, and Management of Production Chair, which was organized on his initiative in the Faculty of Organizers of Industrial Production at the Azerbaijan Institute of Petroleum and Gas imeni M. Azizbekov.

Professor I.P. Kuliyev was a member of the editorial collective of the journal *Azerbaydzhanskoye Neftyanoye Khozyaystvo*, the presidium of the Azerbaijan Scientific and Technical Society of the Petroleum and Gas Industry imeni Academician Gubkin, and the coordinating commission for transport and hydraulic engineering structures. Israfil Piriyevich also supervised the work of the scientific council of the State Scientific Research and Planning Institute of Offshore Petroleum and was a member of the scientific councils of the Azerbaijan Institute of Petroleum and Chemistry imeni M. Azizbekov, the All-Union Scientific Research Institute of Safety Engineering in the Petroleum Industry, and the Institute of Geography of the Azerbaijan SSR Academy of Sciences and a member of the interdepartmental scientific councils of the State Committee for Science and Technology for the problems: "The Study of the Mineral Resources of the Earth and Superdeep Drilling" and "Protection Against Corrosion" and the scientific council of the USSR Academy of Sciences "The Problem of the Caspian Sea."

Professor I.P. Kuliyev performed much work on the broadening of international relations with foreign countries in the area of the development of offshore petroleum and gas deposits. He participated in the work of international congresses and symposiums in France, Mexico, Japan, Czechoslovakia, the GDR, Moscow, and Leningrad.

In 1961 for the work "Kompleksnoye stroitelstvo morskikh nefteprомyslov v Azerbaydzhanskoy SSR" [The Integrated Construction of Offshore Petroleum Fields in the Azerbaijan SSR] I.P. Kuliyev was awarded the lofty title of winner of the Lenin Prize.

For combat services and valiant labor I.P. Kuliyev was awarded the Badge of Honor and the medals "For Combat Services," "For the Defense of the Caucasus," "For the Victory Over Germany," "For Valiant Labor in Commemoration of the 100th Anniversary of the Birth of V.I. Lenin," "25 Years of Victory in the Great Patriotic War," and "Veteran of Labor," as well as the Honorary Diploma of the Presidium of the Azerbaijan SSR Supreme Soviet and was repeatedly awarded goal and silver medals of the Exhibition of USSR National Economic Achievements.

For many years of fruitful activity in the domestic petroleum industry the title "Honored Petroleum Specialist of the USSR" was conferred on him.

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Sergey Nikolayevich Boyev Obituary

18140074b Alma-Ata VESTNIK AKADEMII NAUK KAZAKHSKOY SSR in Russian No 8, Aug 87 p 80

[Article under the rubric "Obituary": "Sergey Nikolayevich Boyev"]

[Text] Kazakh biological science has suffered a grave loss. On 12 June 1987 Academician of the Kazakh SSR Academy of Sciences Sergey Nikolayevich Boyev, a well-known Soviet helminthology scholar, Honored Figure of Science of the Kazakh SSR, doctor of veterinary science, and professor, died at the age of 82.

S.N. Boyev was born in 1905 in the city of Uralsk in the family of an employee.

S.N. Boyev began his labor activity as a veterinary doctor's assistant in Central Asia in 1925 after graduating from the Orenburg Zooveterninary Tekhnikum. In 1932 he graduated from the Saratov Veterinary Institute and linked his life forever with Kazakhstan, having devoted himself to helminthological science. Outstanding organizing abilities and the talent of a researcher enabled him to take charge of the Laboratory of Helminthology (1933) and to be deputy director of the Kazakh SSR Scientific Research Institute of Veterinary Medicine (1954), as well as to manage the Veterinary Section of the Kazakh Affiliate of the All-Union Academy of Agricultural Sciences imeni V.I. Lenin (1955). From 1944 to 1984 he was in charge of the Laboratory of Helminthology of the Institute of Zoology of the Kazakh SSR Academy of Sciences.

Sergey Nikolayevich was one of the leading scientists of the country in the area of the helminthology of game and agricultural animals. The Kazakh school of helminthologists, which was established by him, received extensive recognition.

Under the supervision of S.N. Boyev the epizootology of the most important helminths of sheep, large-horned cattle, camels, hogs, and deer was studied and steps to combat dictyocaulosis and protostrongyloidosis of the lungs, trichostrongyloidosis and cestodosis of the intestines, coenurosis of the brain of sheep, and elephostrongylosis and setariasis of the central nervous system of Siberian stag and sika deer were developed and introduced in practice. He developed and introduced extensively in production a free method of feeding sheep a phenothiazine salt mixture against dictyocaulosis and strongyliadiases.

Sergey Nikolayevich was the author of more than 250 works on various aspects of helminthology, 8 of which are monographs. The works of S.N. Boyev were rated highly both by the scientific community of our country and by the foreign scientific community. For a series of works on the study of nematodes the Academician K.I. Skryabin Prize of the USSR Academy of Sciences was awarded to S.N. Boyev in 1980. His monographs "Protostrongilidozy" [Protostrongyloidoses] and "Metastrongilidozy" [Metastrongyloidoses] were translated into English and were published in the United States and India.

Sergey Nikolayevich also displayed heartfelt sensitivity to people, helped students, supported them, shared his experience and knowledge with young people, and instilled an interest in science in novice scientists. He trained 3 doctors and 25 candidates of sciences.

His activity as a scientist and organized received the appreciation of the party and government: he was awarded two Badges of Honor, the Order of Friendship of Peoples, medals, and honorary diplomas of the republic.

The blessed memory of Sergey Nikolayevich Boyev—a remarkable scientist, educator, tutor of young people, and sensitive and sympathetic person—will remain forever in the hearts of those who knew him and worked with him.

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Shakhmardan Yesenovich Yesenov

18140074a Alma-Ata VESTNIK AKADEMII NAUK KAZAKHSKOY SSR in Russian No 8, Aug 87 p 69

[Article under the rubric "Anniversary Dates": "The 60th Birthday of Academician of the Kazakh SSR Academy of Sciences Sh.Ye. Yesenov"]

[Text] Academician of the Kazakh Academy of Sciences Shakhmardan Yesenovich Yesenov, head of a chair of the Kazakh Order of Labor Red Banner Polytechnical Institute imeni V.I. Lenin, doctor of geological mineralogical sciences, professor, and CPSU member since 1956, has turned 60.

Sh.Ye. Yesenov was born on 5 August 1927 in the settlement of Tartugay of Kzyl-Orda Oblast. He received an elementary education at a rural school and pedagogical tekhnikum in Kzyl-Orda. After graduating in 1949 from the Kazakh Mining and Metallurgical Institute, Sh.Ye. Yesenov covered the path from a rank and file engineer to the chief engineer of the Dzhezkazgan Geological Prospecting Expedition.

Since 1960 he has worked as Kazakh SSR Deputy Minister, then Minister of Geology, chairman of the Kazakh SSR State Production Geological Committee, and deputy chairman of the Kazakh SSR Council of Ministers. For direct participation in and supervision of the work on the identification in Kazakhstan of the

largest petroleum- and gas-bearing province of Southern Mangyshlak the Lenin Prize was awarded in 1966 to Sh.Ye. Yesenov with a group of participants.

In 1967 Sh.Ye. Yesenov was elected academician and president of the Kazakh SSR Academy of Sciences and at the same time director of the Order of Labor Red Banner Institute of Geological Sciences imeni K.I. Satpayev. During this period he directed the activity of the Kazakh SSR Academy of Sciences toward the elaboration of important, urgent problems of science and the development of the national economy of the republic. In 1969 with his participation and supervision the large scientific research effort on the Uspenskiy Ore Series in Central Kazakhstan was completed, for which he was awarded the Kazakh SSR State Prize. For the monograph "Nedra Kazakhstana" [The Mineral Resources of Kazakhstan] Sh.Ye. Yesenov with coauthors was awarded the Ch.Ch. Valikhanov Prize.

The scientific interests of Sh.Ye. Yesenov are diverse. He has published 5 monographs and more than 100 scientific articles on various problems of geology.

Sh.Ye. Yesenov is devoting much attention to the training of scientists and young specialists. He has trained candidates and doctors of sciences. Working since 1979 as head of the Chair of Methods of the Exploration and Prospecting of Mineral Deposits of the Kazakh Polytechnical Institute imeni V.I. Lenin, he gives lecture courses at a high scientific methods level, using extensively the latest methods and techniques of the intensification of the educational processes. He is the author of a number of scientific methods developments on the conducting of lecture classes.

Sh.Ye. Yesenov was elected a deputy of the USSR Supreme Soviet, 8th Convocation, a deputy of the Kazakh SSR Supreme Soviet, the 5th through 11th convocations, and chairman of the Kazakh SSR Supreme Soviet, the 7th and 8th convocations. From 1971 to 1976 he was deputy chairman of the Commission for Public Education, Science, and Culture of the USSR Supreme Soviet. He was a delegate of the 24th CPSU Congress, as well as the 11th-14th congresses of the Communist Party of Kazakhstan. At the 24th CPSU Congress he was elected a candidate member of the CPSU Central Committee, while at the 11th-14th congresses of the Kazakh CP Central Committee he was elected a member of the Kazakh CP Central Committee.

For fruitful scientific and production activity and the training of scientists Sh.Ye. Yesenov has twice been awarded the Order of Lenin, honorary certificates of the Kazakh SSR Supreme Soviet, and the Diploma of the 1st Degree of the All-Union Society for Knowledge.

In celebrating the 60th birthday of Shakhmardan Yesenovich, with all our heart we congratulate him on this celebration and wish him health, long years of life, and new creative successes in his scientific educational activity.

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Georgiy Timofeyevich Zatsepin

18140123a Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 10, Oct 87 pp 127-128

[Article under the rubric "News Items and Information": "Academician G.T. Zatsepin Is 70 Years Old"]

[Text] For services in the development of physical science and the training of scientists and in connection with his 70th birthday by the Ukase of the Presidium of the USSR Supreme Soviet of 27 May 1987 Academician Georgiy Timofeyevich Zatsepin was awarded the Order of the October Revolution.

G.T. Zatsepin is an outstanding scientist and a prominent specialist in the field of cosmic ray physics and neutrino astrophysics. His remarkable capacity for the thorough comprehensive analysis of physical phenomena appeared already in his first independent works, which were devoted to the study of extended atmospheric showers. The discovery by him at the turn between the 1940's and 1950's of the nuclear cascade process led to the radical change of the ideas that existed during those years about the nature of the interaction of nucleons at high energies and the development of extended atmospheric showers. The study of the nuclear cascade made it possible to establish the basic characteristics of the elementary interaction act. Nearly a quarter century was required to see and confirm the picture of interaction at accelerators.

These pioneering works of G.T. Zatsepin in 1951 were commended by the State Prize, while the subsequent studies of extended atmospheric showers were commended by the Lenin Prize, which was awarded in 1982.

He made a fundamental contribution to the study of the propagation of cosmic rays in the interstellar medium and their passage through the atmosphere and ground. The obtained results of the study of the spectra of muons and atmospheric neutrinos became classic. Owing to the successful combination of experimental and theoretical ideas the plans of large-scale low-background experiments, which were advanced by him, anticipated by many years the appearance of similar plans abroad and to a significant extent determined the nature of modern neutrino physics. The Baksan Neutrino Observatory for the search for rare processes, which are connected with phenomena in the microcosm and in the nuclei of the sun and collapsing stars, were established under the supervision of G.T. Zatsepin. Unique scintillators, which constitute the basis of the service presently being formed for the observation of neutrino bursts from the gravitational collapses of stars, were built.

Owing to the thorough understanding by G.T. Zatsepin of the prospects of the development of science a collective, which is capable of implementing an extensive research program in the field of cosmic ray physics and neutrino astrophysics, was formed under his supervision at the Institute of Nuclear Research of the USSR Academy of Sciences.

Being a professor of Moscow University, G.T. Zatsepin for many years has been performing pedagogical work on the training of highly skilled specialists. He is also devoting much effort to scientific organizational work as deputy academician secretary of the Nuclear Physics Department of the USSR Academy of Sciences.

In the salutatory address sent to the celebrator the Presidium of the USSR Academy of Sciences commended his scientific services and wished him further successes and many years of active creative life.

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Kurban Nazamaddin ogly Dzhalilov
18140102 Baku BAKINSKIY RABOCHIY in Russian 27 Oct 87 p 4

[Article (Azerinform): "Award"]

[Text] For services in the development of the earth sciences and the training of scientists and in connection with his 60th birthday Corresponding Member of the republic Academy of Sciences Kurban Nizamaddin ogly Dzhalilov, deputy director of the Institute of Problems of Deep Petroleum and Gas Deposits of the Azerbaijan SSR Academy of Sciences, by the Ukase of the Presidium of the Azerbaijan SSR Supreme Soviet was awarded the Honorary Diploma of the Presidium of the Azerbaijan SSR Supreme Soviet.

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Valentin Valentinovich Novozhilov Obituary
18140116b Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 9, Sep 87 p 125

[Article under the rubric "In Memory of Scientists": "Valentin Valentinovich Novozhilov"]

[Text] Soviet science has suffered a great loss. On 14 June 1987 Academician Valentin Valentinovich Novozhilov, a well-known scientist, Hero of Socialist Labor, and Lenin Prize winner, died suddenly at the age of 77.

V.V. Novozhilov was born on 18 May 1910 in the family of railroad engineer. After graduating in 1931 from Leningrad Polytechnical Institute imeni M.I. Kalinin he devoted more than 50 years of his labor activity to shipbuilding. From 1938 until his last days of life V.V. Novozhilov worked at the Central Scientific Research Institute imeni Academician A.N. Krylov.

V.V. Novozhilov was one of the well-known organizers of Soviet science and headed a number of scientific councils of the USSR Academy of Sciences for applied problems of mechanics.

The development of new directions of research and methods of design of ship components and the theory of elasticity and ductility is connected with the name of V.V. Novozhilov. The basic works of V.V. Novozhilov were published in numerous monographs and articles. His works were the theoretical basis for the solution of a large number of problems of the strength of ships and marine engineering structures.

V.V. Novozhilov combined much scientific and organizing work with the training of scientists. For more than 40 years he taught at Leningrad State University imeni A.A. Zhdanov. His students are in charge of scientific collectives of sectorial and academic institutes and higher educational institutions.

For outstanding services to the homeland the title of Hero of Socialist Labor was conferred on V.V. Novozhilov, he was awarded two Orders of Lenin, the Order of the October Revolution, the Order of Labor Red Banner, and the Badge of Honor, the Lenin Prize was awarded to him.

The blessed memory of Valentin Valentinovich Novozhilov, a talented scientist and organizer of science, will remain forever in our hearts.

[Signed
L.N. Zaykov, Ye.K. Ligachev, Yu.F. Solovyev, A.N. Yakovlev, Yu.D. Maslyukov, G.I. Marchuk, O.S. Belyakov, V.A. Grigoryev, I.S. Belousov, K.F. Frolov, A.N. Gerasimov, A.M. Fateyev, N.M. Luzhin, A.I. Voznesenkiy, I.A. Glebov, I.V. Gorynin, N.N. Isanin, S.N. Kovalev, N.S. Solomenko, L.D. Faddeyev, I.D. Spasskiy, S.P. Merkuryev, V.V. Dmitriyev

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Georgiy Ivanovich Petrov Obituary
18140116a Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 9, Sep 87 pp 123-124

[Article under the rubric "In Memory of Scientists": "Georgiy Ivanovich Petrov"]

[Text] Soviet science has suffered a grave loss. On 13 May 1987 Academician Georgiy Ivanovich Petrov, a prominent Soviet scientist in the field of aeromechanics, gas dynamics, and space research, a Hero of Socialist Labor, and winner of USSR State Prizes, died.

G.I. Petrov was born in 1912 in the city of Pinega of Arkhangelsk Oblast. He began his labor activity at the age of 16 at the Ivanovo Weaving Mill. In 1935 he graduated from Moscow University. While still an undergraduate, he began scientific work at the Central Aerohydrodynamics Institute.

The basic works of G.I. Petrov of this period were devoted to the solution of complex scientific and technical problems, which contributed to the rapid development of aeronautics. The laws of the interaction of shock waves and the boundary layer, which were established by Georgiy Ivanovich Petrov, were of fundamental importance for the solution of the problem of achieving supersonic speeds in aeronautics and astronautics.

During the years of the Great Patriotic War Georgiy Ivanovich conduct a number of important studies, which made it possible to increase the aerodynamic and combat properties of Soviet aircraft.

Since 1944 G.I. Petrov was the supervisor of the most important integrated research in the field of the gas dynamics of hypersonic speeds and the founder of the school of gas dynamic experts, who thoroughly combined theoretical analysis with bold experiments.

Together with Academicians S.P. Korolev and M.V. Keldysh G.I. Petrov was at the source of space research. G.I. Petrov and associates successfully solved the problem of the heat protection of the first manned descent spacecraft.

In 1966 G.I. Petrov was the organizer and director of the Institute of Space Research of the USSR Academy of Sciences. His creative energy was aimed at the implementation of an extensive program of research, which was connected with the study of near earth and interplanetary space and the planets of the solar system by means of automatic and manned spacecraft.

G.I. Petrov devoted much energy and effort to pedagogical activity at Moscow University, where since 1955 he managed the Chair of Aeromechanics and Gas Dynamics.

In 1953 G.I. Petrov was elected a corresponding member of the USSR Academy of Sciences and in 1958 an academician.

The contribution of G.I. Petrov to the solution of ecological problems is significant. The large amount of work performed by him on the scientific evaluation of the plans of the diversion of a portion of the runoff of northern rivers contributed to the adoption of an important government decision.

The Soviet state rated highly the scientific, pedagogical, and public activity of G.I. Petrov. He was awarded the title of Hero of Socialist Labor, four Orders of Lenin, three Orders of Labor Red Banner, and medals. The USSR State Prize was twice presented to him.

The blessed memory of Georgiy Ivanovich Petrov, a true son of the homeland, will remain forever in the hearts of the Soviet people.

[Signed] The Presidium of the USSR Academy of Sciences, the USSR Ministry of Higher and Secondary Specialized Education, the Problems of Machine Building, Mechanics, and Control Processes Department of the USSR Academy of Sciences, the General Physics and Astronomy Department of the USSR Academy of Sciences, the Institute of Problems of Mechanics of the USSR Academy of Sciences, the Institute of Space Research of the USSR Academy of Sciences, Moscow State University imeni M.V. Lomonosov, the Central Aerohydrodynamics Institute imeni N.Ye. Zhukovskiy

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Anatoliy Nikolayevich Yefimov Obituary

18140121c Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 10, Oct 87 p 72

[Article under the rubric "In Memory of Scientists": "Anatoliy Nikolayevich Yefimov"]

[Text] Soviet science has suffered a grave loss. On 18 July 1987 Academician Anatoliy Nikolayevich Yefimov, a CPSU member and prominent Soviet economist, died after a serious, long illness at the age of 79.

A.N. Yefimov was born on 16 July 1908 in the city of Troitsk of Chelyabinsk Oblast and in 1937 graduated from the Engineering Economics Faculty of the Ural Industrial Institute imeni S.M. Kirov. After graduating from the institute he did much scientific teaching work at the Ural Polytechnical Institute and the Ural Affiliate of the USSR Academy of Sciences. During the years of the Great Patriotic War he actively participating in the organization of special production in the Urals.

Starting in 1955 A.N. Yefimov was for 20 years the director of the newly established Scientific Research Institute of Economics attached to the USSR State Planning Committee and made a significant contribution to the elaboration of important problems of the socioeconomic development of the USSR, to the improvement of the methodology and organization of long-range planning, and to the development of advanced methods of economic analysis and forecasting.

In 1968 the USSR State Prize was awarded to A.N. Yefimov for a series of studies on the development of methods of the analysis and planning of intersectorial relations and the sectorial structure of the national economy. In 1964 he was elected a corresponding member and in 1970 a full member of the USSR Academy of Sciences and was a member of the USSR State Planning Committee, deputy academician secretary of the Economics Department of the USSR Academy of Sciences, and a member of a number of scientific councils of the USSR Academy of Sciences.

The tireless search for new solutions, creative boldness in combination with great organizing abilities, modesty, and the sensitive, attentive treatment of people distinguished A.N. Yefimov. His services were appreciated by the Communist Party and the Soviet state. He was awarded the Order of Lenin, the Order of Labor Red Banner, and USSR medals.

The blessed memory of A.N. Yefimov, a remarkable scientist and man, will remain for a long time with those who worked with him and who knew him.

[Signed] N.N. Slyunkov, N.V. Talyzin, G.I. Marchuk, P.N. Fedoseyev, B.I. Gostev, S.A. Sitaryan, V.P. Mozhin, Yu.A. Belik, A.G. Aganbegyan, O.T. Bogomolov, N.P. Fedorenko, S.S. Shatalin, V.N. Kirichenko, V.G. Kostakov, V.P. Sulyagin

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Yevgeniy Mikhaylovich Lavrenko Obituary

18140121b Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 10, Oct 87 pp 70-71

[Article under the rubric "In Memory of Scientists": "Yevgeniy Mikhaylovich Lavrenko"]

[Text] Soviet science has suffered a great loss. On 18 July 1987 Academician Yevgeniy Mikhaylovich Lavrenko, a prominent botany scholar and honorary president of the All-Union Botanical Society, died at the age of 87.

Ye.M. Lavrenko was born on 24 February 1900 in the city of Chuguyev. In 1922 he graduated from Kharkov University, having published his first floristic study back in 1918. For 12 years he studied the flora and vegetation of the Ukraine and at the same time performed pedagogical work. Starting in 1926 his articles on the history of flora and the problem of relics, which already during those years brought him fame among botanists, were published.

In 1934 Ye.M. Lavrenko became an associate of the Botany Institute of the USSR Academy of Sciences in Leningrad, where he worked until the last days of his life. The study of the flora and vegetation of the arid and subarid territories of Eurasia, botanical geographic regionalization, the history of flora and vegetation, the study of the geography of species of plants, the cartography and typology of vegetation, the study of the structure of plant communities, the comprehensive study of ecobiomorphs, the development of the theory of the phytogeosphere and methods and programs of geobotanical research, and the classification of plants were the basic directions of his research. During the years of the Great Patriotic War he actively participated in the organization of the botanical service for defense purposes.

Ye.M. Lavrenko was the author of more than 500 works, including the monograph "Osnovnyye cherty botanicheskoy geografii pustyn Evrazii i Severnoy Afriki" [The Basic Traits of the Botanical Geography of Deserts of Eurasia and Northern Africa] (1962), which was awarded the V.L. Komarov Prize of the USSR Academy of Sciences. He supervised the Expedition on Field Protection Afforestation of the USSR Academy of Sciences (1949-1952), the Mongolian Agricultural Expedition of the USSR Academy of Sciences (19550-1952), a special complex expedition on lands of new agricultural development of the Council for the Study of Productive Forces of the USSR Academy of Sciences (1954-1955), the Biocomplex Expedition of the Botany and Zoology Institutes of the USSR Academy of Sciences in Central Kazakhstan, and others.

In 1963 Ye.M. Lavrenko was elected president of the All-Union Botanical Society and from 1966 to 1979 was editor in chief of the leading organ of USSR botanists—*Botanicheskiy Zhurnal*. For a number of years he headed the Scientific Council of the USSR Academy of Sciences for the Problem "The Comprehensive Biogeocenological Study of Living Nature and the Scientific Principles of Its Efficient Development and Protection," was a member of the presidium of the Scientific Council of the USSR Academy of Sciences for the Problem "The Biological Principles of the Efficient Use, Transformation, and Protection of the Plant World," performed a number of other public scientific duties, and gave scientific assistance to scientists of the socialist countries.

In 1946 he was elected a corresponding member of the USSR Academy of Sciences and in 1968 was elected a full member of the USSR Academy of Sciences; he was also a member of a number of foreign academies of sciences and scientific societies.

In 1980 the V.N. Sukachev Gold Medal of the USSR Academy of Sciences was awarded to him for a set of works in the area of plant ecology, phytocenology, and nature conservation—many ideas substantiated by V.N. Sukachev, with whom Ye.M. Lavrenko was linked by many years of friendly relations, underwent further development in this research.

For services to the homeland Ye.M. Lavrenko was awarded two Orders of Lenin, the Order of the October Revolution, the Order of the Patriotic War, 2d Degree, and the Order of Labor Red Banner.

Among colleagues, to whom Yevgeniy Mikhaylovich always showed real concern, he invariably enjoyed genuine respect. The blessed memory of him will remain forever.

[Signed] The Presidium of the USSR Academy of Sciences, the Leningrad Scientific Center of the USSR Academy of Sciences, the General Biology Department of the USSR Academy of Sciences, the Botany Institute imeni V.L. Komarov of the USSR Academy of Sciences, the Scientific Council for the Problem "The Biological Principles of the Efficient Use and Protection of the Plant World" of the USSR Academy of Sciences, the All-Union Botanical Society, the Joint Soviet-Mongolian Complex Biological Expedition

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Aleksandr Ivanovich Anchishkin Obituary
18140121a Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 10, Oct 87 pp 68-69

[Article under the rubric "In Memory of Scientists": "Aleksandr Ivanovich Anchishkin"]

[Text] Soviet science has suffered a grave loss. On 24 June 1987 Academician Aleksandr Ivanovich Anchishkin, a CPSU member, a prominent Soviet economist, and director of the Institute of Economics and Forecasting of Scientific and Technical Progress of the USSR Academy of Sciences, died suddenly at the age of 53.

A.I. Anchishkin was born on 11 August 1933 in Moscow. After graduating in 1956 from Moscow State University imeni M.V. Lomonosov he worked at the Scientific Research Institute of Economics attached to the USSR State Planning Committee, at the Central Institute of Economics and Mathematics of the USSR Academy of Sciences, as chief of a department and a member of the Collegium of the USSR State Planning Committee, and as director of the Institute of Economics and Forecasting of Scientific and Technical Progress of the USSR Academy of Sciences.

A.I. Anchishkin made a significant contribute to the development of the theory of socialist reproduction and to the elaboration of economic problems of the acceleration of scientific and technical progress. Large-scale scientific research and applied development in the area of the scientific, technical, and socioeconomic development of the country were carried out under his supervision. A demanding manager, who was thoroughly devoted to science and knew how to see its long-range trends, A.I. Anchishkin established a scientific school which is widely known for its achievements in the development of the theory and methods of the forecasting of the national economy. He was one of the initiators and supervisors of the formulation of the Comprehensive Program of USSR Scientific and Technical Program for a Long-Term Period.

A.I. Anchishkin performed active pedagogical work at Moscow State University imeni M.V. Lomonosov and was a brilliant and indefatigable propagandist of the achievements of science and technology.

For outstanding scientific achievements A.I. Anchishkin was elected in 1976 a corresponding member and in 1984 a full member of the USSR Academy of Sciences. A.I. Anchishkin was deputy academician secretary of the Economics Department of the USSR Academy of Sciences, deputy chairman of the Scientific Council for Problems of Scientific, Technical, and Socioeconomic Forecasting attached to the Presidium of the USSR Academy of Sciences and the USSR State Committee for Science and Technology, and a member of the USSR State Planning Committee.

Energy, the tireless search for new solutions, creative boldness in combination with great organizing abilities, modesty, and the sensitive, attentive treatment of people distinguished Aleksandr Ivanovich.

The services of A.I. Anchishkin were appreciated by the Communist Party and the Soviet state. He was awarded the Order of the October Revolution, the Order of Labor Red Banner, and USSR medals.

The blessed memory of A.I. Anchishkin, a remarkable scientist and man, will remain in our hearts.

[Signed] M.S. Gorbachev, Ye.K. Ligachev, N.I. Ryzhkov, N.N. Slyunkov, A.N. Yakovlev, B.N. Yeltsin, N.V. Talyzin, V.A. Medvedev, G.I. Marchuk, V.M. Kamentsev, B.L. Tolstykh, V.A. Grigoryev, Ye.P. Velikhov, V.A. Kotelnikov, A.A. Logunov, P.N. Fedoseyev, K.V. Frolov, V.P. Mozhin, G.K. Skryabin, A.G. Aganbegyan, G.A. Arbatov, O.T. Bogomolov, A.N. Yefimov, Ye.M. Primakov, A.M. Rumyantsev, N.P. Fedorenko, T.S. Khachaturov, L.I. Abalkin, V.L. Makarov, S.A. Sitaryan

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Boris Nikolayevich Naumov
18140160b Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 11, Nov 87 pp 106-107

[Article under the rubric "News Items and Information": "Academician B.N. Naumov Is 60 Years Old"]

[Text] For services in the development of science and the training of scientists and in connection with his 60th birthday Academician Boris Nikolayevich Naumov by the Ukase of the Presidium of the USSR Supreme Soviet of 9 July 1987 was awarded the Order of Lenin.

B.N. Naumov, winner of the USSR and Ukrainian SSR State Prizes, is a well-known scientist and organizer of science in the field of computer technology. His early works on the general theory of nonlinear control systems already became well known in the USSR and abroad. For 17 years he headed the Institute of Electronic Control Machines. Control computer complexes of the ASVT-M and SM EVM family, which for many years have served as the base for systems of the automation of scientific research, information and computer complexes, the automation of designing, and management in the national economy, were developed and introduced in series production under his supervision. Important research in the field of the programs of microprocessor complexes, computer networks, and complexes with special processors, including the Fourier processor, which made it possible to obtain a picture of Venus, was conducted with his direct participation. The Institute of Problems of Information Science of the USSR Academy of Sciences, which was established on his initiative and is headed by him, is successfully accomplishing the tasks set for it in the area of computers of mass application.

While general designer of the International System of Small Computers, B.N. Naumov made a substantial contribution to the organization of international cooperation in the field of computer technology. With his active participation collectives of scientists of the USSR Academy of Sciences and the academies of sciences of the socialist countries formulated "The Concept of New Generations of Computer Systems," which specified the basic directions of basic and applied research in the field of computer technology for the next few years. He is the organizer and general director of the Personalnyye EVM Interbranch Scientific Technical Complex, which is called upon to head the work in the USSR and in the CEMA countries on the development of systems of microcomputers, including personal computers, which are uniform in architecture and the element base.

The scientific achievements and important organizing activity of B.N. Naumov have found recognition abroad. He was elected a foreign member of the GDR Academy of Sciences.

In the salutatory address, which was sent to the celebrator, the Presidium of the USSR Academy of Sciences commended his services and wished him health and further creative successes.

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Tribute to Academician Aleksandr Vasilyevich Sidorenko

18140160a Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 11, Nov 87 pp 99-105

[Article by Academician A.L. Yanshin under the rubric "Memorable Dates": "Academician Aleksandr Vasilyevich Sidorenko. On the 70th Anniversary of His Birth"]

[Text] Aleksandr Vasilyevich Sidorenko was one of the most prominent Soviet geologists and a public and state figure. He was born on 19 october 1917 in a peasant family in one of the villages of present-day Voroshilovgrad Oblast of the Ukraine. After graduating from a rural school and the workers' faculty attached to Voronezh University A.V. Sidorenko in 1934 became a student of the Geology Faculty of this university and in 1940 successfully completed instruction and was registered as a graduate student at the Mineralogy Chair. Back during his student years he published scientific articles on the minerals of the Crimea and Taman Peninsula.

During the first days of the Great Patriotic War A.V. Sidorenko left for the front, he participated in many battles as a battery commander and received serious wounds during the defense of Stalingrad. In 1943 he was demobilized and was sent to work at the Geology Institute of the Turkmen Affiliate of the USSR Academy of Sciences, where until 1950 he was a senior scientific associate, and then head of the Department of Minerals. Here his creative abilities and breadth of scientific interests appeared vividly.

First of all A.V. Sidorenko completed the processing of the materials on the mineralogy of the iron ores of Kerch Peninsula in the Crimea, which had been collected back before the war, and published on this theme a number of articles, which were submitted for publication by Academician A.Ye. Fersman. Then he began the study of the mineralogy and geochemistry of the hydrothermal lodes of Western Kopetdag, which were discovered by him, and in 1945 successfully defended his candidate dissertation, which was devoted to these lodes. The discovery in Kopetdag of lodes, which contain barite, sphalerite, natrojarosite, galena, cinnabar, and other hydrothermal minerals, dispelled the doubts with respect to the possibility of grouping Kopetdag with structures of the alpine fold system.

The scientific services of A.V. Sidorenko in the field of mineralogy were immediately recognized: in 1947 he was elected a member of the All-Union Mineralogical Society. In 1971 he was elected an honorary member of the society and in 1976 its president.

While dealing with the problems of mineralogy, A.V. Sidorenko simultaneously studied the geochemical, geological, soil, and geomorphological processes that are characteristic of territories with a pronounced arid climate. In 1948 a soil map of Turkmenia on a 1:1000000 scale, which was compiled with the participation of A.V. Sidorenko, was published, then a series of articles, which were devoted to the lithology, mineralogy, and geochemistry of the Neogenic and Quaternary continental deposits which make up the Karakumy Desert, as well as articles covering its geomorphology followed. Many of the conclusions, which were obtained in these studies, proved to be fundamentally new.

Thus, having studied the composition of the coarse gravels and gravel in various suites of sandy rocks of the Karakumy Desert, he ascertained that the lowest of them, which are of Pliocene age, were deposited by rivers which flow from the ridges of the Southern Tyan Shan Mountains; the rocks located higher contain detrital material which was brought from the Pamir Mountains, while the youngest suites in the southeastern part of the desert formed as a result of the washing away of material from the ridges of the Hindu Kush and Paranamiz Mountains in Afghanistan. Thus, in a similar rock mass of alluvial sandy deposits it is possible to distinguish suites with a specific composition of gravel-pebble material and to compare them with a breakdown by regions that are remote from each other. These conclusions were drawn by A.V. Sidorenko in the article "An Attempt at the Separation of the Continental Rock Masses of the Karakumy According to the Composition of the Gravel-Pebble Particles" (1955).

In a number of works of A.V. Sidorenko, which were completed in Turkmenia, the changes of the granulometric and mineralogical composition of sands which are shifted by the wind, as well as the stratification of aeolian sandy accumulations were studied. He came to the conclusion that the type of sloping stratification, which was considered typical of aeolian deposits, in reality is characteristic only of dunes on the banks of rivers and shores of seas of the humid climatic zone. Such stratification is absent in the aeolian sands of deserts and, having been found in ancient deposits, cannot serve as proof of an arid climate.

While studying the Karakumy, A.V. Sidorenko came to the conclusion that the sands of the deserts of Central Asia are less mobile than the sands of dunes and usually are not displaced relative to the sandy substrate of the bed rocks, due to the shifting of which they were formed. In rare cases owing to being carried significant distances they acquire granulometric and mineralogical differences.

However, the geochemical processes that occur in modern deserts were the main object of the research of A.V. Sidorenko in Turkmenia. He ascertained that these processes in many respects depend on the peculiarities and chemical composition of the bed rocks, the deflation of which is conducive to the formation of aeolian sands. He described various forms of the separation of gypsum and carbonates, which form the desert crusts, which are prevalent not only in Turkmenia, but also in other deserts of the world. (Later A.V. Sidorenko studied the desert crusts in the arid zones of Mexico, Egypt, Algeria, Kenya, and Australia, moreover, he succeeded in explaining their genesis and paleogeographic significance.)

A number of works of A.V. Sidorenko are devoted to the study of the processes of the dehydration of minerals, which occurs in the top well-heated layer of sandy deserts. Gypsum turns into a white loose hemihydrate of calcium sulfate, decahydrate sodium sulfate—mirabilite—turns into a loose powder of dihydrate sodium sulfate, ferric hydroxides turn into hematite, and opal turns into chalcedony. These phenomena were noted back in 1924 by Academician A.Ye. Fersman and were called pseudohydrothermal by him, but A.V. Sidorenko studied them in detail.

In light of his works the widespread opinion about the presence in the sands of the Karakumy of siliceous concretions and crusts proved to be incorrect. Such formations are encountered under the arid conditions of northern Australia, the Kalahari Desert in southern Africa, and the Atacama Desert in northern Chile. However, in the deserts of Central Asia silica is geochemically nearly immobile, while gypsum, limestone, or limestone-sand dense formations were taken as siliceous concretions.

In 1950 great changes occurred in the life of A.V. Sidorenko. On the suggestion of the Presidium of the USSR Academy of Sciences he took the position of deputy chairman and, starting in 1952, chairman of the Presidium of the Kola Affiliate of the USSR Academy of Sciences. While working in the North, A.V. Sidorenko for a long time retained an interest in the geological problems of deserts. In 1952 he defended his doctoral dissertation on the theme "On the Mineralogy and Geochemistry of the Continental Rock Masses of the Karakumy Desert," while he continued to publish individual articles on this theme over all three subsequent decades of his life. Precisely for outstanding works in the field of the geology of deserts A.V. Sidorenko in 1953 was elected a corresponding member of the USSR Academy of Sciences.

However, there gradually appeared in the works of A.V. Sidorenko "northern" themes which were connected with his studies of the territory of the Kola Peninsula. As is known, this territory is a part of the Baltic Shield which was formed by metamorphic rocks of the Lower Proterozoic and Archean eras. Above these ancient rocks only Quaternary deposits, which are represented by the moraine of the last glaciation in the central parts of the peninsula and by marine benches on its rocky shores, were known.

In 1955 A.V. Sidorenko established at the Geology Institute of the Kola Affiliate the Department of Quaternary Geology and Geomorphology, the staff members of which dealt with the investigation of the geological history of the Kola Peninsula prior to the Quaternary glaciation. Previously it was believed that during the period of the last glaciation all traces of the prequaternary geological processes had been destroyed here. A.V. Sidorenko proved the erroneousness of this opinion. On the Kola Peninsula the carrying away of the surface of rocks by moving glaciers (exaration) occurred only on the elevated sections of the terrain, while in depressions

on vast areas ancient weathering crusts with a thickness in places of up to 100 meters and continental sedimentary deposits of different age were preserved.

During field operations of 1953-1955 thick ancient weathering crusts, which had formed under the conditions of a hot climate, were found at 13 points of the Kola Peninsula, on ancient rocks that were most different in composition. In 1956 in the eastern part of the peninsula, where glacial activity was negligible, they succeeded in finding a vast area of their development. In 1958 the monograph of A.V. Sidorenko "Doledniikovaya kora vyvetrivaniya Kolskogo poluostrova" [The Preglacial Weathering Crust of the Kola Peninsula] was published, while later a series of articles on the geomorphological prerequisites of the search for alluvial deposits, on the prequaternary stage of the continental development of the Baltic Shield, and on several questions of the study of its sedimentary cover was published. A.V. Sidorenko established that the terrain of the Kola Peninsula is connected with block tectonics, moreover, the movements along the fractures here resumed during the alpine orogenesis in southern Europe and even during the postglacial era under the influence of the general arched isostatic uplift of the Baltic Shield. The areas of occurrence of the ancient weathering crust were preserved mainly in young tectonic depressions, to which the depressed sections of the terrain correspond. Ore minerals, which are resistant to weathering, are concentrated in these crusts.

The discovery of the large Kovdor deposit of vermiculite, which is now being worked, is connected with the study of the ancient weathering crusts of the Kola Peninsula.

The lithology of the Precambrian metamorphic rock masses of the Kola Peninsula became another theme of the research of A.V. Sidorenko. In 1958 together with O.I. Luneva he published the article "On the Stratified Textures in the Metamorphic Rocks Masses of the Kola Peninsula" and in 1961 the monograph "K voprosu o litologicheskom izuchenii metamorficheskikh tolshch" [On the Question of the Lithological Study of Metamorphic Rock Masses]. Before the appearance of these works it was believed that in the process of regional metamorphism the characteristic traits of the primary origin of rocks are lost as a result of recrystallization. A.V. Sidorenko and O.I. Luneva convincingly showed that metamorphic rocks of sedimentary origin retain such most important traits of original genesis as stratification, signs of ripple marks, the texture, form, and dimensions of detritus, and, in many cases, the original chemical composition. The study of these primary sedimentary relics helps to interpret the premetamorphic stage of ancient sedimentation, and at times even to reconstruct the paleogeographic conditions, under which the sediments formed.

The indicated works marked the beginning of the study of sedimentary rocks of the early Precambrian. Latter A.V. Sidorenko interested many geologists with this problem. At the Geology Institute of the USSR Academy of Sciences he organized a laboratory of the lithology of ancient sedimentary metamorphized rock masses. Methods of the differentiation of para-amphibolites and orthoamphibolites according to the isotopic composition of oxygen were developed under his supervision. The collections of articles "Problemy osadochnoy geologii dokembriya" [Problems of the Sedimentary Geology of the Precambrian] were published under his editorship. A.V. Sidorenko devoted reports at international geological and geochemical congresses to various aspects of this problem.

At the same time as scientific activity A.V. Sidorenko performed much organizational work at the Kola Affiliate. This affiliate was founded in 1930, but by the time of the arrival there of A.V. Sidorenko it consisted of only a few laboratories, which were located in apartment houses of the mining settlement of Kukisvumchorr. In 12 years on the initiative of A.V. Sidorenko a scientific center was built and the Geology Institute, the Mining Institute, the Institute of Chemistry of Rare Elements and Mineral Raw Materials, and the Polar Geophysics Institute were established. While supervising the affiliate, A.V. Sidorenko did much for the development of a network of scientific research institutes and the comprehensive study of the natural resources of Murmansk Oblast, for the solution of important national economic problems, and the introduction in practice of the results of scientific research.

His scientific organizing abilities could not remain unnoticed, and in 1961 he was hired to work in Moscow, where starting in 1962 he held the position of USSR Minister of Geology and the Protection of Nature Resources.

In this new position in addition to much current work A.V. Sidorenko implemented measures, which are aimed at the development of research in promising directions of geology, at the strengthening of the material and technical base of geological institutes and production enterprises, and at the improvement of the creative contacts and ties of science with production. Exploration and prospecting for petroleum in Western Siberia, for gas in Turkmenia and Uzbekistan, and for nonferrous, ferrous, and precious metals in previously unstudied regions of the Far East, Northern Siberia, and the European North of the USSR were launched.

In 1963 the Institute of Economics of Mineral Raw Materials and Geological Prospecting was established with the participation of A.V. Sidorenko. In Aleksandrov, near Moscow, he organized the All-Union Institute of the Synthesis of Mineral Raw Materials, which soon became a most prominent scientific research center, which was furnished with advanced experimental equipment and a pilot works.

On the initiative of A.V. Sidorenko starting in the early 1970's in the system of the USSR Ministry of Geology the geological studies of the bed of seas of the USSR were significantly expanded and new equipment for such studies was developed. The All-Union Institute of Marine Geology and Geophysics was organized in Riga, the Scientific Research Institute of Marine Geophysics was organized in Krasnodar. The Sevmorgeologiya Scientific Production Association in Leningrad and the Yuzhmorgeologiya Scientific Production Association in Gelendzhik were also established.

A.V. Sidorenko devoted much attention to studies of the technology of the concentration and processing of mineral raw materials and to the complete use of ores. The experimental base of technological research was strengthened significantly, at a number of institutes the comprehensive study of the technological properties of ores was organized for the purpose of the most complete economically sound extraction of the useful components contained in them.

A.V. Sidorenko did much for the introduction in geological operations of remote methods, including aerospace methods. On his initiative at the Aerogeologiya Association the principles of geological mapping were successfully developed, which made it possible to identify on aerospace photographs structures that are favorable for the localization of some types of minerals or others.

On his initiative in 1972 a special design bureau of geophysical instrument making for the implementation of the suggestions of geophysicists of the Siberian Department of the USSR Academy of Sciences was established in Novosibirsk and the drilling of a superdeep well on the Kola Peninsula for the study of the structure of the earth's crust on the shields of ancient platforms was begun.

The tenure of office of minister could not but affect the nature of the publications of A.V. Sidorenko. Many articles in newspapers and journals were of a publicistic nature. In them skillful agitation in favor of the close contact of theoretical research in the field of geology with the tasks of the development of the national economy was conducted, at times criticism of the shortcomings in the organization of the geological service was contained in them or the results of the work of Soviet geologists were summarized and the tasks for the immediate and distant future were specified. A portion of the publications of that time are surveys of the state of mineral raw material resources.

Scientific articles of A.V. Sidorenko on various questions of the geology of the Precambrian also continued to be published. The carboniferous rock masses of the Precambrian and the generation by them of methane, which he called "the hydrocarbon respiration of the earth's crust," as well as conglomerates and carbonaceous rocks of the early Precambrian and the comparison of sedimentation during the Precambrian with the later Phanerozoa attracted his particular attention. The research, which proved the primarily sedimentary genesis of the granulites of the Kola Peninsula, as well as the articles of A.V. Sidorenko in the field of geomorphology and space geology belong to this period.

In 1966 A.V. Sidorenko was elected a full member of the USSR Academy of Sciences and in 1975 a vice president.

At the Academy of Sciences A.V. Sidorenko continued active scientific organizational work. In 1976 he organized under the Presidium of the Academy of Sciences the Commission for the Study of Natural Resources by Space Means and became its chairman. Since 1977 this commission has been holding conferences on various questions of the practical use of space photographs, while in 1980 it achieved the publication of the new journal ISSLEDOVANIYE ZEMLI IZ KOSMOSA. A.V. Sidorenko became editor in chief of this journal and published a number of articles in it. In one of them he introduced the new term "space physical geography," which soon became widespread.

In 1976 A.V. Sidorenko was elected chairman of the Scientific Council of the USSR Academy of Sciences for Problems of the Biosphere and quickly gave a broad scope to this work, which was new for him. The council began to hold large regional conferences in various cities of the country, at which questions of the protection of natural resources, the ecology of man, and his adaptation to extreme conditions were posed and settled. In conformity with the recommendations of these conferences the local organs of Soviet power made and implemented the necessary decisions.

In 1979 A.V. Sidorenko organized at the Academy of Sciences the Institute of the Lithosphere, of which the study of the evolution of various geological processes over the lengthy history of the earth became the main task. In 1980 at the request of the Moscow City Soviet a group made up to three laboratories of the engineering geology type was established at this institute for the evaluation of the geological conditions of the construction of skyscrapers, metro lines, and underground supply lines. A.V. Sidorenko was the director of the Institute of the Lithosphere until the last day of his life.

A.V. Sidorenko was one of the best known Soviet geologists abroad. He headed Soviet delegations at many international congresses. His articles were published in scientific journals of Hungary, Poland, the GDR, Czechoslovakia, Bulgaria, Cuba, and the United States. Poland, the GDR, Czechoslovakia, Bulgaria, and Mongolia awarded him various medals, while the Mining and Metallurgy Academy in Krakow elected him a doctor honoris causa.

A.V. Sidorenko traveled much, and one of the trips ended tragically for him. On 22 march 1982, while in Algeria, he was in a car accident and died. Soviet geology was deprived of a talented scientist and organizer of science, when he was only 65 years old.

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Gennadiy Alekseyevich Yagodin

18140160c Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 11, Nov 87 p 107

[Article under the rubric "News Items and Information": "Corresponding Member of the USSR Academy of Sciences G.A. Yagodin Is 60 Years Old"]

[Text] For services in the development of the higher school and the training of science teachers and in connection with his 60th birthday Corresponding Member of the USSR Academy of Sciences Gennadiy Alekseyevich Yagodin, USSR Minister of Higher and Secondary Specialized Education, by the Ukase of the Presidium of the USSR Supreme Soviet of 2 June 1987 was awarded the Order of Lenin.

In the salutatory address, which was sent to the celebrator, the Presidium of the USSR Academy of Sciences noted that the works of USSR State Prize winner G.A. Yagodin, a prominent scientist in the field of inorganic chemistry and chemical technology, made an important contribution to the development of the theoretical principles and technological methods of the extraction separation and purification of rare metals and created a new scientific direction in the kinetics of extraction processes. This made it possible to influence actively and purposefully the speed of reactions and mass transfer and to approach in a new way the interpretation of the mechanism of processes. Under the supervision of the scientist basic research on the chemistry and technology of zirconium and hafnium and of rare earth elements was conducted, which played a large role in the development of extraction technological processes, which ensure the increase of the completeness of the use of polymetallic raw materials; a number of new highly efficient extractors were also developed.

At the Chair of Industrial Ecology, which was established by G.A. Yagodin, at the Moscow Chemical Technology Institute (MKhTI) imeni D.I. Mendeleyev the special-purpose training of specialists is being carried out and important scientific research on the extraction of harmful components from gas emissions and industrial sewage and on the recovery of waste products is being performed. As rector of the Moscow Chemical Technology Institute he devoted much effort to the matter of training highly skilled specialists.

G.A. Yagodin is combining much scientific and pedagogical work with state and public activity. He was elected a member of the CPSU Central Committee and a deputy of the USSR Supreme Soviet. While USSR Minister of Higher and Secondary Specialized Education, he headed the active restructuring of the system of higher educational in the country, which was aimed at the complete supply of the national economy with personnel.

The Presidium of the USSR Academy of Sciences wished the celebrator health, inexhaustible energy, and creative activity for the good of the homeland.

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Mikhail Vladimirovich Alfimov

18140160d Moscow VESTNIK AKADEMII NAUK SSSR in Russian No 11, Nov 87 p 108

[Article under the rubric "News Items and Information": "Corresponding Member of the USSR Academy of Sciences M.V. Alfimov Is 50 Years Old"]

[Text] For services in the development of chemical sciences and the training of scientists and in connection with his 50th birthday Corresponding Member of the USSR Academy of Sciences Mikhail Vladimirovich Alfimov by the Ukase of the Presidium of the USSR Supreme Soviet of 6 July 1987 was awarded the Order of Friendship of Peoples.

The studies of the laws of the photochemistry of solid substances, which were conducted by M.V. Alfimov, played an important role in the development of the theoretical and practical principles of silver-free photographic processes and the recording of information. He discovered the phenomenon of the transfer of the energy of electron excitation from the highest triplet states and established the connection between the electron structure of molecules and the effectiveness of their photochemical and photophysical transformations in these states.

The thorough analysis of the reactions of photodecomposition and photoisomerization, the establishment of the connection between the spectral properties and the kinetic constants of these reactions and the highest achievable photographic characteristics of the layer, and the theoretical examination of the basic stages of the photographic process enabled M.V. Alfimov to predict the photographic characteristics of the silver-free materials being developed. The principle of the multistage increase of the primary effect of light in photographic processes, which was formulated and substantiated by him, is of great scientific and practical importance.

M.V. Alfimov is the supervisor of basic research in the field of photographic processes and one of the founders of a new direction of the photochemistry of a solid—photochemical phase transitions in molecular substances. He showed the important role of organized molecular structures in the development of new photochemical systems of the recording and processing of information, formulated the principles of the construction of highly sensitive silver-free materials with the "dry" method of developing the imagine, and developed specimens of

light-sensitive composites. Luminescent photography, which is being developed by the scientist, is of fundamental importance for the solution of a number of technical problems.

Along with scientific work M.V. Alfimov is devoting much attention to the training of highly skilled scientists. His scientific activity as deputy director of the Institute of Chemical Physics of the USSR Academy of Sciences, deputy chairman of the Scientific Council of the USSR Academy of Sciences for the Problem "Photographic Processes of the Recording of Information," as well as USSR representative on the International Committee for Scientific Photography is fruitful.

The Presidium of the USSR Academy of Sciences sent the celebrator a salutatory address, in which it commended his scientific services and wished him good health, happiness, and further creative successes for the good of the homeland.

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